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A REVIEW OF THE TAXONOMY OF THE *SOREX VAGRANS* SPECIES COMPLEX FROM WESTERN NORTH AMERICA

By

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Before the publication of Findley's monograph, *Speciation of the Wandering Shrew* (1955a), the *Sorex vagrans* complex was thought to consist of at least three closely related species: *Sorex vagrans, S. obscurus,* and *S. pacificus.* Jackson (1928) separated these species on the basis of size and pelage color; throughout much of the Pacific Northwest at least two of the taxa can be collected at the same localities. However, in the northern Rocky Mountains, especially in western Montana, *vagrans* and *obscurus* are so similar in size and pelage color that mammalogists found them impossible to distinguish (Clothier, 1950; R. S. Peterson, *pers. comm.*; P. L. Wright, *pers. comm.*). Findley (1955a) interpreted these similarities as an indication that barriers to interbreeding between *vagrans* and *obscurus* had broken down along much of their zone of contact. He speculated that the two forms had a common origin prior to the Wisconsin glaciation and had diverged while isolated from one another during the final glacial period. *Sorex obscurus* appeared to intergrade also with *Sorex pacificus* (including *S. yaquinae*) in western Oregon. Findley concluded that the three species were in fact one—a complex ring of overlapping subspecies to which he applied the name of the earliest described form, *Sorex vagrans.* He

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compared this "*Rassenkreis*" to those reported for the Herring Gull, *Larus argentatus* (see Mayr, 1963), the Old World titmouse, *Parus major* (Rensch, 1933), and the garter snake, *Thamnophis ordinoides* (Fitch, 1940) among others.

Findley distinguished *obscurus* from *vagrans* as subspecies, but his descriptions do not permit easy identification. Mammalogists working with shrews from the Rocky Mountains and other areas where the two forms differ subtly, tended to lump *vagrans* and *obscurus* together as "*Sorex vagrans*" with the unfortunate result that important differences between the two were obscured (e.g., Brown 1967; Hoffmann and Taber, 1960; Ingles, 1961; Spencer and Pettus, 1966; in all cases the shrew identified as *vagrans* was actually *obscurus* (Fig. 1). Findley's revision was greeted cautiously by some. Johnson and Ostenson (1959) suggested that the biological relationships among the subspecies of Findley's *Sorex vagrans* were too poorly known to justify his sweeping revision of the nomenclature, and proposed that the basic framework of Jackson's 1928 classification be upheld until further studies could be made.

Findley's conclusions were based on his interpretation of the nature of character convergence between *vagrans* and *obscurus* in the northern Rocky Mountains (1955a: 12-13, 44-45, and 54-55). We attempted to locate "pure" populations of the two supposed subspecies, in order to define their differences and clarify their morphological and ecogeographic relationships (Hennings, 1970). We found differences in the structure and pigmentation of the upper incisor teeth and in cranial dimensions which clearly separated *vagrans* and *obscurus*, and confirm their specific integrity, as will be shown.

Sorex monticolus, Merriam 1890, long considered a synonym of *Sorex vagrans*, is the oldest available name for the species previously known as *S. obscurus* Merriam, 1895. The familiar name is applicable only to the most widely distributed subspecies, *S. m. obscurus* (Fig. 2). *Sorex pacificus* is morphologically distinct from

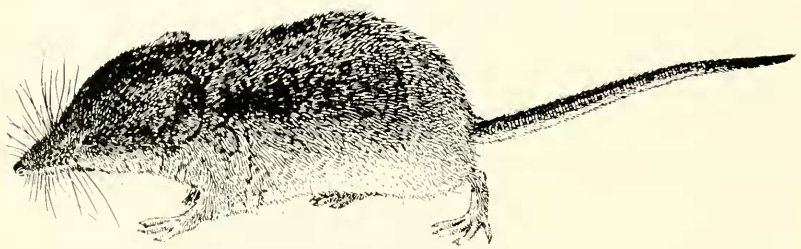


FIG. 1.—*Sorex monticolus obscurus*, Sierra Nevada, Fresno Co., Calif. (Adapted from a photo in Ingles, 1961, where the shrew was identified as *Sorex vagrans*.) × 4/5.

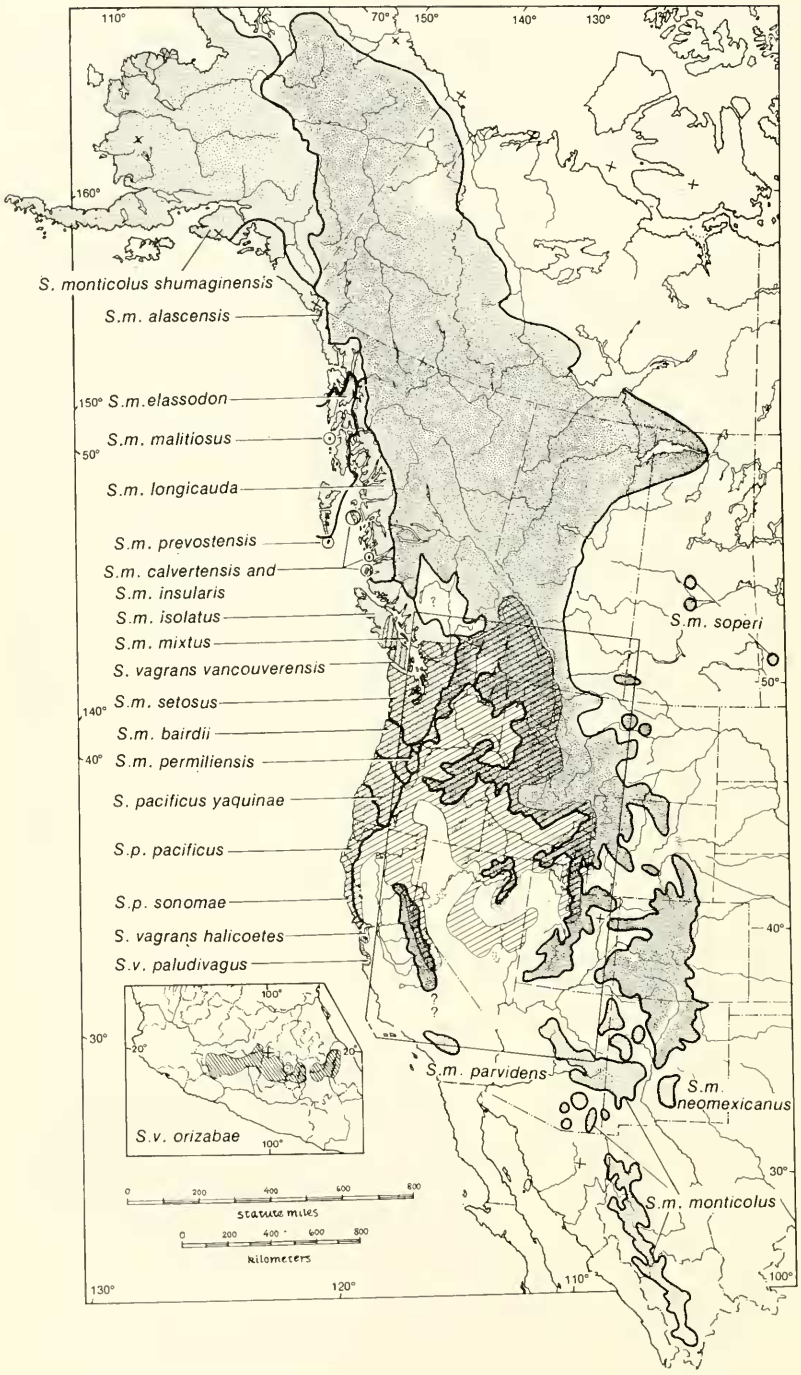
S. *monticolus* (=S. *obscurus*), but as Findley observed, there appears to be a narrow zone of hybridization between the two taxa. We discuss certain taxonomic problems which may arise as the nature of their relationship becomes more fully understood. In the rest of this paper we use the names *Sorex monticolus* (=*obscurus*), S. *pacificus* and S. *vagrans*.

Materials and Methods

Hennings collected, at key localities in western Montana, 94 *Sorex v. vagrans* and S. *monticolus obscurus*, using snap-traps and sunken cans (Hennings, 1970). Subsequently, we also examined 2,502 additional specimens, including all subspecies of *Sorex vagrans*, S. *monticolus* and S. *pacificus* (including S. *yaquinae*), as well as S. *durangae*, which Jackson (1928) included in the *Sorex vagrans* group, and S. *trigonirostris*, which he allied with S. *ornatus* (Fig. 2). Specimens were borrowed from the following collections (see also Specimens Examined, Appendix): Brigham Young University Life Sciences Museum (BYU); California Academy of Sciences (CAS); California State University, Long Beach (CSLB); Carol Terry (CT); Dartmouth College Museum (DCM); Harvard University, Museum of Comparative Zoology (MCZ); Michigan State University, The Museum (MSU); Montana State University, Bozeman, Department of Zoology (MSUDZ); National Museum of Natural History (USNM); National Museum of Natural Science, Ottawa (NMC); San Diego Natural History Museum (SDSNH); Southern Oregon College (SOMNH); Stanford University Collection, at the California Academy of Sciences (CAS-SU); University of Alberta, Museum of Zoology (UAMZ); University of British Columbia Vertebrate Museum (UBC); University of California, Berkeley, Museum of Vertebrate Zoology (MVZ); University of Kansas, Museum of Natural History (KU); University of Montana, Zoological Museum, Missoula (UM); Universidad National Autónoma de México (UNAM); University of Utah (UU); Washington State University, Charles R. Connor Museum (CRCM).

In the initial phase of the study 408 post-juvenile S. *v. vagrans* and 115 S. *monticolus obscurus* from the northern Rocky Mountains and Columbia Plateau regions were selected for statistical analysis. Specimens were identified by body measurements and by tooth characteristics described below. Six cranial dimensions described by Findley (1955a:5), plus cranial height, were measured with Helios metric dial calipers. Age was determined by Rudd's (1955a) subjective toothwear method.

Data from the largest homogeneous population of each species were grouped by age and month of capture and analyzed statistically. (Sex differences in *Sorex* have no significant effect on cranial


S. monticolus shumaginensis
S.m. alascensis
S.m. elassodon
S.m. malitiosus
S.m. longicauda
S.m. prevostensis
S.m. calvertensis and
S.m. insularis
S.m. isolatus
S.m. mixtus
S. vagrans vancouverensis
S.m. setosus
S.m. bairdii
S.m. permiliensis
S. pacificus yaquinae
S.p. pacificus
S.p. sonomae
S. vagrans halicoetes
S.v. paludivagus
S.v. orizabae
S.m. soperi
S.m. parvidens
S.m. neomexicanus
S.m. monticolus
Statute miles
Kilometers

morphology; see Rudd, 1955a.) Of the six measurements used by Findley only one, maxillary tooth-row length, varied significantly with age. Cranial height varied according to the patterns noted by Dehnel (1949), Pucek (1955, 1957), and Dapson (1968). (See discussion in Hennings, 1970).

Hennings (1970) grouped specimens into several geographical populations, the cranial dimensions of which were compared statistically. For this report we have regrouped some of the smaller samples (Fig. 3), and will compare data from only the three most variable measurements; condylobasal length, palatal length, and least interorbital breadth (Fig. 7, A). Pelage color and body measurements were not analyzed in detail (but see Hennings, 1970).

Acknowledgements

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Analysis of Morphological Characters

Jackson (1928) distinguished *Sorex obscurus* from *Sorex vagrans* on the basis of total length – *obscurus* being 110 mm or greater and *vagrans* less than 110 mm. Figure 4 is a review of total length measurements from shrews collected in a number of regions in the Pacific Northwest. *Sorex monticolus obscurus* tends to be larger

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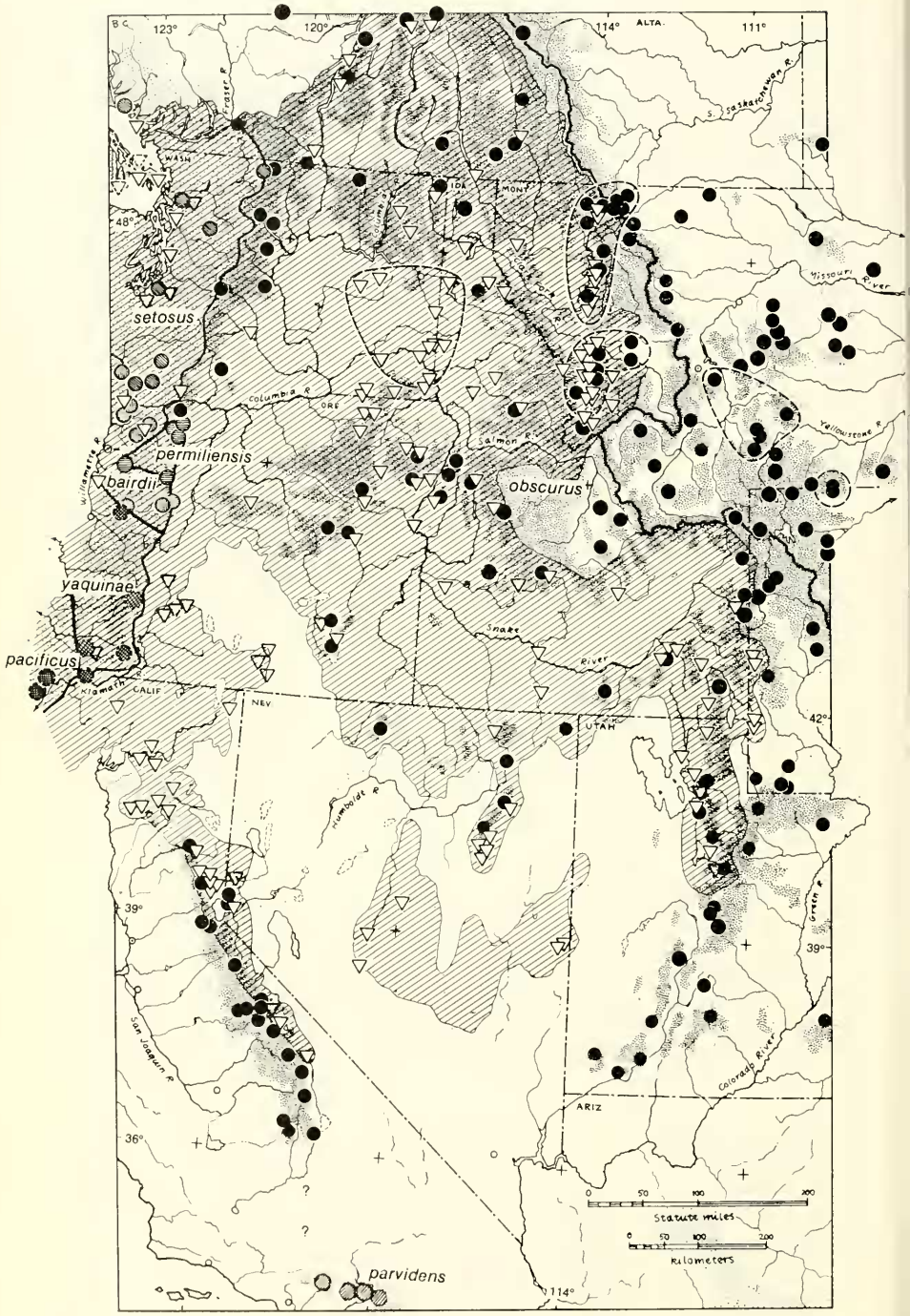
Fig. 2.—Approximate distribution of the races of *Sorex vagrans*, *S. monticolus*, and *S. pacificus* (modified from Findley, 1955a). The range of *S. monticolus obscurus* is stippled darkly; those of other *monticolus* subspecies, and of *pacificus* are lightly stippled. (The boundary between *obscurus* and coastal subspecies in Canada and Alaska is based in part on vegetation patterns and is somewhat speculative.) The range of *S. vagrans* is cross-hatched. Ranges of *S. v. vagrans* and *S. m. obscurus* are considered in more detail in Fig. 3 (inset area).


B.C.
123°
120°
114°
ALTA.
111°
WASH.
IDA.
MONT.
48°
setosus
Columbia R.
ORE.
permiliensis
bairdi
obscurus
yaquinae
pacificus
Klamath
CALIF.
NEV.
UTAH
42°
39°
36°
ARIZ.
parvidens
Statute miles
Kilometers
0
50
100
200
300

than S. *v. vagrans,* but the overlap is so broad that the 110 mm separation point is unworkable.

Heptner and Dolgov (1967) and Yudin (1969), described the medial tines on the first upper incisors of the Asian shrew *Sorex mirabilis,* and of S. *v. vagrans* from Montana. *Sorex pacificus,* with which *mirabilis* had been synonymized (Brobinskii *et al.,* 1944), appears typically to lack this structure (Heptner and Dolgov, 1967; Hoffmann, 1971; see Fig. 5C). *Sorex vagrans* and S. *monticolus* can be distinguished easily by differences in the position of the medial tines and their relationship to the red pigment on the first upper incisors (Fig. 5A, B). In *vagrans* the tines are typically small, and located near the upper limit of the pigment; they usually are set off distinctly by a break in the color. In *monticolus* the tines are typically large, and situated well *below* the top of the pigment, which is darker and more extensive than that of *vagrans.* In live-trapping S. *v. vagrans* and S. *monticolus setosus* in British Columbia, Myrnal Hawes has noticed that the teeth of *monticolus* are more robust, harder and more brittle than those of *vagrans.* Thus, they appear to wear more slowly but break more easily than do those of *vagrans* (pers. comm.).

These differences in tooth pattern remain unchanged with age, although they may be obscured in old shrews as the teeth break and the pigment wears away (Fig. 5A, B). The two patterns do not grade into each other. Measurements with optical micrometer of tine-pigment relationships in 83 S. *v. vagrans* and 57 S. *monticolus obscurus* from two homogeneous allopatric populations showed no overlap (Hennings, 1970). We have distinguished *vagrans* and *monticolus* with a hand lens while live-trapping in Montana, although the technique is difficult to apply to old adults. Myrnal and Dave Hawes (*pers. comm.*) have had similar success in British Columbia, with a population that Cowan and Guiguet (1956:52) thought "demonstrates complete intergradation between S. *m. setosus* . . . and S. *v. vagrans,* suggesting conspecificity."

Sorex monticolus generally is larger than *S. vagrans,* even in western Montana where size differences between the subspecies S. *v. vagrans* and S. *m. obscurus* are slight. There is as much over-

FIG. 3.—Approximate distribution of *Sorex vagrans* (cross-hatched), S. *monticolus* and S. *pacificus* (stippled), with details of the sympatric ranges of S. *v. vagrans* and S. *m. obscurus* in the intermountain West. Selected specimens of *vagrans* examined are represented by hollow triangles; *monticolus,* by intact circles; *pacificus,* by broken circles; not all specimens examined are plotted. Ranges are based on literature and collection records combined with vegetation patterns from U.S. and Canadian National Atlases. Symbols outside shaded areas are records from insular montane populations adjacent to areas of continuous distribution. Localities enclosed by dashed lines comprise the populations used in statistical analysis of cranial morphology (Figs. 6 and 7).

lap in condylobasal length, which appears to be a function of body size, as there is in total length (Fig. 6A). However, differences in some skull proportions are conspicuous. The skull of *S. m. obscurus* is significantly broader through the orbits than that of *S. v. vagrans* (Fig. 6B), and the palate is significantly longer (Fig. 6C). A trivariate analysis, plotting the three proportions as percentages of their total, shows virtually no overlap between the two species (Fig. 7B).

Systematic Accounts

The following synonymies include only those references relevant to the scope of this report. Formal treatment centers on the two most widely distributed taxa in the *Sorex vagrans* complex, *S. v. vagrans* and *S. monticolus obscurus*, which were studied intensively in western Montana. Other subspecies are discussed briefly, as is *S. pacificus*.

Sorex vagrans Baird
Vagrant or Wandering Shrew

Sorex vagrans Baird, 1858:15. (Type locality, Shoalwater Bay, Pacific Co., Washington).

Sorex suckleyi Baird, 1858:18. (Type locality, Steilacoom, Pierce Co., Washington).

Sorex amoenus Merriam, 1895:69. (Type locality, near Mammoth, 8000 ft. E. slope Sierra Nevada, Mono Co., California).

Sorex nevadensis Merriam, 1895:71. (Type locality, Reese R., 6000 ft., Nye-Lander Co. Line, Nevada).

Sorex shastensis Merriam, 1899:87. (Type locality, Mt. Shasta, 5700 ft., Siskiyou Co., California).

Sorex trigonirostris Jackson, 1922:264. (Type locality, Ashland, 1975 ft., Jackson Co., Oregon).

Holotype.—Adult male, alcoholic; USNM 1675, from Shoalwater (Willapa) Bay, Pacific Co., Washington.

Range.—The subspecies *Sorex vagrans vagrans* is found in riparian and montane habitats throughout the northern Great Basin and the Columbia Plateau, north to southern British Columbia and east almost to the Continental Divide in Montana, the Wasatch Mountains in Utah, and barely entering Wyoming; coastal mountains of Washington, Oregon and California, as far south as the San Francisco Bay and the east-central Sierra Nevada (Fig. 3). One subspecies, *vancouverensis*, is found on Vancouver Island and its nearby offshore islands. *Sorex vagrans halicoetes* and *S. v. paludivagus* are restricted to the southern San Francisco Bay and Monterey Bay Region. *Sorex vagrans orizabae* appears to be an isolated

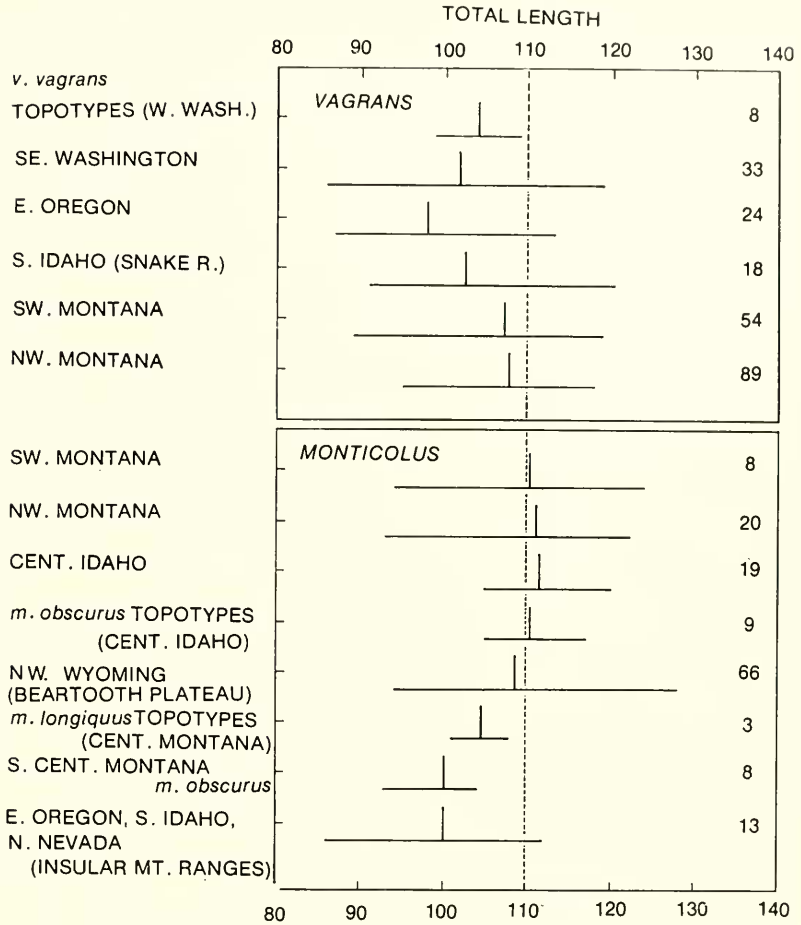


FIG. 4.—Range and mean of total length (mm) from intermountain populations of *Sorex vagrans vagrans* and *S. monticolus obscurus*. Sample size is indicated along the right margin. Samples are grouped by region, and are somewhat broader than the statistical populations identified in Figure 3.

relict restricted to coniferous forests on the Transverse Volcanic Belt along the southern edge of the Mexican Plateau (Goldman, 1951) (Fig. 2).

Diagnosis.—Small to medium-sized shrews of the subgenus *Otisorex*; third unicuspid tooth smaller than fourth, and foramen magnum situated more or less ventrally (Findley, 1955a). Medial tines on first upper incisors situated at approximately the upper edge of the pigment; set off distinctly by a gap in color (Fig. 5, A). This character is fairly uniform throughout the range of *Sorex vagrans*, and in *S. v. vancouverensis* and *S. v. halicoetes*, although upper in-

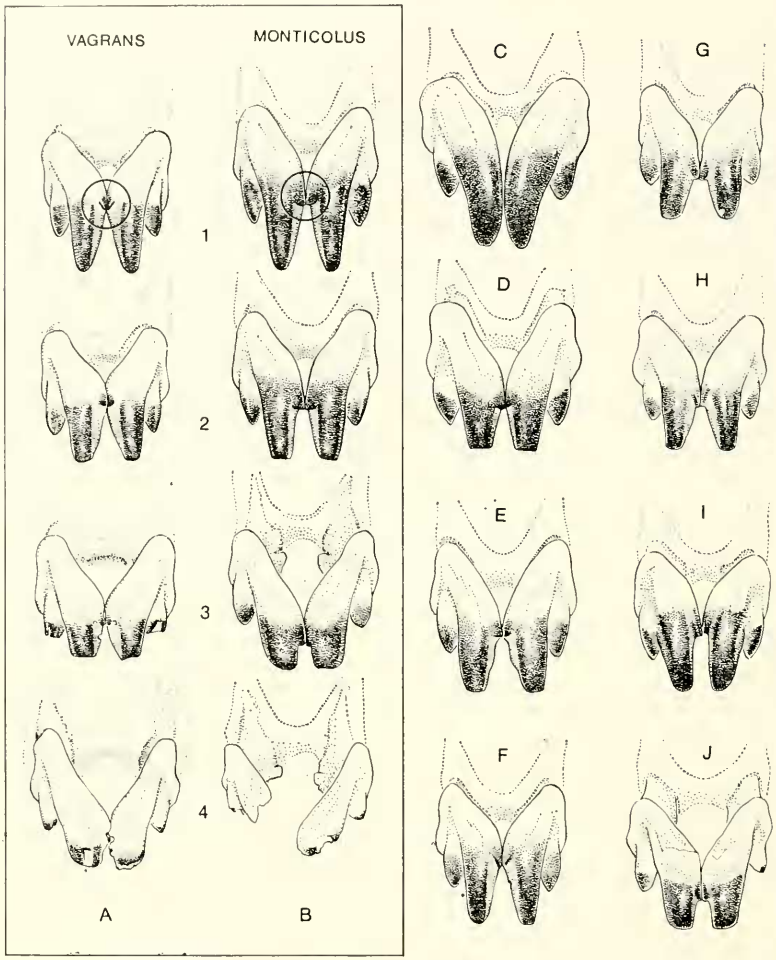


FIG. 5.—Frontal views of first upper incisors from *Sorex vagrans*, *S. monticolus*, *S. pacificus*, and related shrews in the subgenus *Otisorex:* (A. and B.) *S. v. vagrans* (Hamilton, Mont.) and *S. m. obscurus* (Beartooth Plateau), compared by Rudd age classes 1-4. Note differences in structure of medial tines (circled). (Specimens, A: DCM 3030, 3076, 2922, 2993; B: UM, 7186, 8954, 7185, 8188); (C.) *S. pacificus pacificus*, Requa, Calif. (CAS 3810); (D.) *S. p. yaquinae* x? *S. m. bairdi*, "hybrid", Taft, Ore. (MVZ 71219); (E.) *S. monticolus longicauda*, Wrangel, Alaska. (CAS 9196); (F.) *S. v. vagrans*, Cassel, Calif. (USNM, BS 49127), hybrid-like pattern; (G.) *S. cinereus cinereus*, Atlin, B.C. (CAS 7436); (H.) *S. ornatus californicus*, Piedmont, Alameda Co., Calif. (CAS 3941); (I.) *S. pribilofensis*, St. Paul Is., Alaska (CAS 2869); and (J.) *S. "durangae", (=m. monticolus)*, El Salto, Durango, Mex. (USNM, 94539).

cisors of some *S. v. vagrans* in northeastern California, southern Idaho and northern Utah are more heavily pigmented and have

larger tines (Fig. 5F). This is also true of the one specimen of *S. v. paludivagus* examined. This deviation occurs sporadically in other populations, and will be discussed below. The geographically isolated subspecies, *S. v. orizabae*, has a typical *vagrans* pattern; although Findley (1955a) felt it was little differentiated from *S. monticolus*, Jackson (1928) correctly allied it with *Sorex vagrans*.

Among populations of *S. vagrans vagrans*, total length is quite variable, ranging from 86 mm to at least 120 mm, with means generally from 98-108 mm. (compared with means of 100-112 mm in *S. monticolus obscurus*. Condylobasal length varies similarly, ranging from 15.5 to 17.5 mm in the populations examined, with means 16.2-16.9 (Hennings, 1970). Larger skulls are found among montane populations. Least interorbital breadth provides a real measure of distinction between *S. v. vagrans* and *S. m. obscurus*. Although it ranges from 2.7 to 3.5 mm, the least interorbital breadth of at least 80 percent of all specimens of *vagrans* is below 3.2 mm; in contrast, about the same percentage of *obscurus* have least interorbital breadths greater than 3.2 mm. (See Fig. 6B; estimate based on overlap of standard deviations.) Palatal length in *S. v. vagrans* ranges from 6.1 to 7.3 mm, but is less than 7.0 mm in at least 80 percent of the specimens; *S. m. obscurus* is generally greater than 7.0 mm (Fig. 6C). See Findley (1955a) for size and color variation in other subspecies.

Remarks.—Findley (1955a) was the first to recognize that the small shrew of the northern intermountain region, *S. v. vagrans*, was not the same as *Sorex "vagrans" monticola* from Arizona. He also united the several populations which Jackson (1928) had treated as subspecies with *vagrans*. West of the Cascades, south along the Pacific Coast, and into the Sierra Nevada and Great Basin, *S. v. vagrans* is found in a variety of habitats. On the Columbia Plateau it occupies riparian habitats within grassland, sagebrush prairie and ponderosa pine forest. Where it enters the mountains in northern Nevada, Oregon, Washington, Idaho, and western Montana and Wyoming, the subspecies is usually found in forests of Douglas fir, lodgepole pine, western larch, grand fir, western hemlock, and red cedar, at elevations below 5,000 ft. *Sorex monticolus obscurus*, *S. c. cinereus*, *S. palustris navigator*, and *Microsorex hoyi washingtoni* may live in geographic sympatry in this area.

Sorex v. vagrans from steppe and arid forest in Washington, Oregon, and Idaho are smaller than the typical form from the Washington coast (Fig. 4). The so-called "Oregon dwarf shrew," *S. trigonirostris*, is a small *S. v. vagrans*. Comparison of the type, and a near-topotype on which Jackson (1928) based the name, with series of *vagrans* to the east and west, as well as other specimens from Jackson County indicates that although the type specimen is at the lower end of the size range for *S. v. vagrans* (condylobasal

length, 15.6 mm), other specimens from the area show normal size variation. Characteristics of the incisors, unicuspids, and foramen magnum position also agree with those of *S. vagrans*, and distinguish "*trigonirostris*" from the *ornatus* group, in which it was placed by Jackson (1928).

The largest *S. v. vagrans* are found in moist grassland and forest in western Montana, where winters in the shrew's microhabitat are less severe than on the more barren Columbia Plateau. Mezhzherin (1964) demonstrated that size variation in shrews does not follow Bergmann's Rule; shrews from colder, more severe, climates are smaller rather than larger than those from regions of milder winters. This appears to be an adaptation to decreased food supply and increased metabolic demands in regions of colder weather. Gebczynski (1965) suggested that seasonal size reduction in individual shrews (Dehnel, 1949; Pucek, 1963, 1965) has a similar adaptive function.

Sorex monticolus Merriam
Montane or Dusky Shrew

Sorex monticolus Merriam, 1890:43. (Type locality, San Francisco Mtn., 11,500 ft., Coconino Co., Arizona).

Sorex dobsoni Merriam, 1891:33. (Type locality, Alturas Lake, E base Sawtooth Mts., 7200 ft., Blaine Co., Idaho; *Nomen oblitum*, see below).

Sorex vagrans similus Merriam, 1891:34. (Type locality, near Timber Cr., 8200 ft., Lemhi Mts., Lemhi Co., Idaho). Name preoccupied by *Sorex similus* Hensel, 1855:459 (=*Neomys similus*).

Sorex obscurus Merriam, 1895:72. (New name for *S. vagrans similus* Merriam, 1891; see below for validity of *obscurus* as a subspecies name).

Sorex vagrans obscurus Findley, 1955:54. (New combination).

Sorex vagrans longiquus Findley, 1955:49. (Type locality, 25 mi ESE Big Sandy, Choteau Co., Montana).

Sorex vagrans obscuroides Findley, 1955:58. (Type locality, Bishop Cr., 6600 ft., Inyo Co., California).

Holotype.—Adult male, skin and skull, USNM 17599/24535, Biol. Surv. Coll., from San Francisco Mtn., 11,500 ft., Coconino Co., Arizona.

Range.—The nominate race *S. m. monticolus* is found in the isolated mountain ranges of eastern Arizona, western New Mexico,

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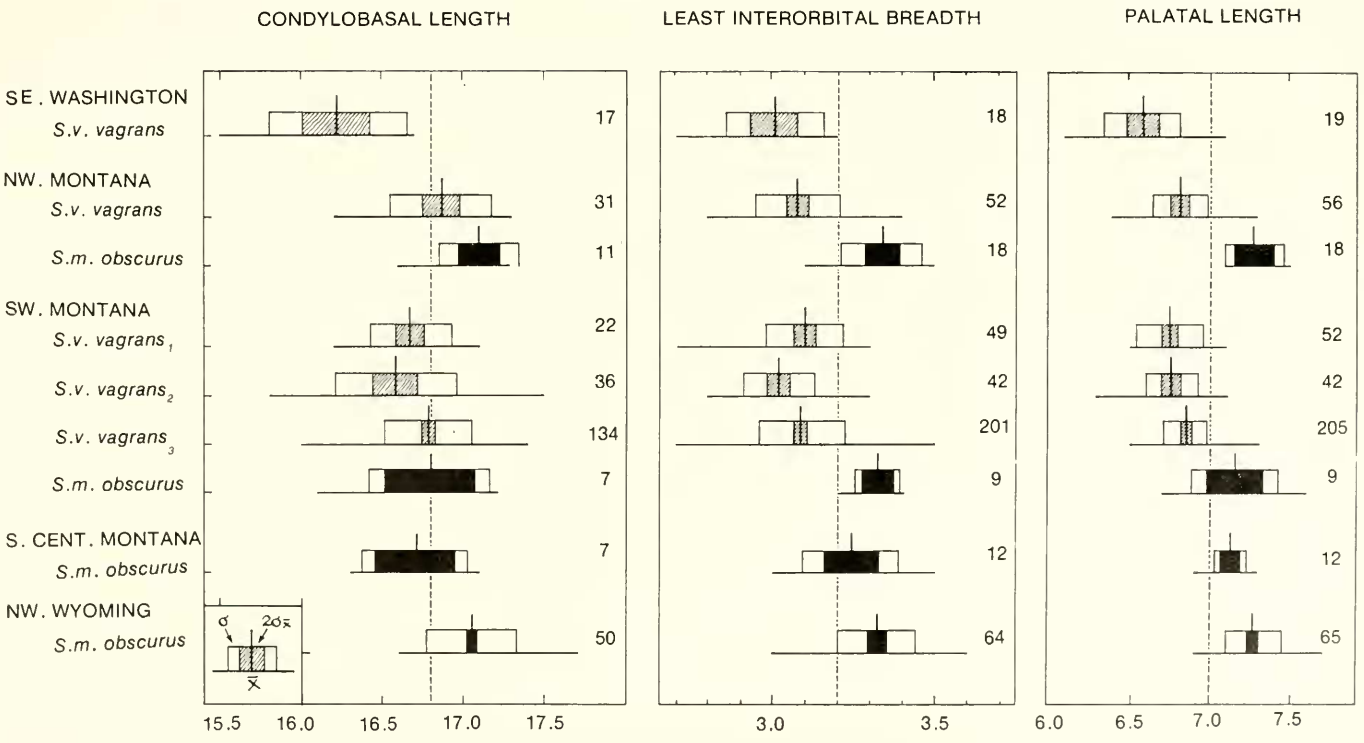
FIG. 6.—Geographical variation in three skull dimensions (mm, see Fig. 7A). The three *S. v. vagrans* populations from "SW Montana" are from 1) Missoula and the lower Bitteroot Valley, 2) the Sapphire Range, and 3) Hamilton and vicinity. The "NW Wyoming" *S. m. obscurus* population is from the Beartooth Plateau (see map, Fig. 3).


CONDYLOBASAL LENGTH
LEAST INTERORBITAL BREADTH
PALATAL LENGTH
SE. WASHINGTON
S.v. vagrans
NW. MONTANA
S.v. vagrans
S.m. obscurus
SW. MONTANA
S.v. vagrans1
S.v. vagrans2
S.v. vagrans3
S.m. obscurus
S. CENT. MONTANA
S.m. obscurus
NW. WYOMING
S.m. obscurus
17
18
19
31
52
56
11
18
18
22
49
52
36
42
42
134
201
205
7
9
9
7
12
12
50
64
65
σ
2σx̄
x̄
15.5
16.0
16.5
17.0
17.5
3.0
3.5
6.0
6.5
7.0
7.5

and northwestern Mexico. The subspecies S. *m. obscurus* occupies the interior of western North America from central Alaska south to New Mexico, primarily in the Rocky Mountains. Two geographically isolated subspecies, S. *m. neomexicanus* and S. *m. soperi,* are probably derived from these Rocky Mountain populations (Fig. 2). Around the northern and southern edges of the Columbia Plateau S. *m. obscurus* grades into S. *m. setosus* in the Washington Cascades and approaches S. *m. permilliensis* and S. *m. bairdii* in western Oregon (Fig. 3). Populations of S. *m. obscurus* extend through the mountains of Utah and northern Nevada, to the Sierra Nevada, with an isolated montane race, S. *m. parvidens,* in southern California (Fig. 2). A series of coastal subspecies, some of which are characterized by a variant tooth pattern, extends northward from Vancouver Island to Alaska – *isolatus, mixtus, calvertensis, insularis, prevostensis, longicauda, malitiosus, elassodon, alascensis,* and *shumaginensis* – the last also extending into interior Alaska (Fig. 2). *Sorex monticolus* is appropriately named; its habitat is mainly montane, boreal and coastal coniferous forest and alpine barrens.

Diagnosis.—Small to medium size shrews of the subgenus *Otisorex,* similar to S. *vagrans,* but with medial tines on the first upper incisors typically situated well below the top edge of the tooth pigment. The tines are larger, the pigment darker, and the incisors more robust than those of *vagrans* (Fig. 5B). The tooth pattern sometimes approaches that of *vagrans* among the northwest coastal races (Fig. 5E); this confusing anomaly is discussed below.

The races of *Sorex monticolus* are exceedingly variable. Clines of increasing and decreasing size, and changes in intensity of pelage pigmentation proceed in many directions, especially among the coastal mountain ranges (Findley, 1955a). S. *monticolus obscurus* were as small as 86 mm long, and as large as 128 mm; mean total length varied from 100-112 mm. Condylobasal length ranged from 16.1 to 17.7 mm, averaging 16.7-17.1 mm. Least interorbital breadth averaged about 3.3 mm, ranging from 3.0-3.6 mm among the four populations analyzed statistically. Palatal length ranged from 6.7-7.7 mm, averaging 7.1-7.3. (See diagnosis of S. *v. vagrans* for comparisons; also Fig. 6A-C.)

Remarks.—The usual habitat of *Sorex monticolus obscurus* on the Columbia Plateau and in the northern Rocky Mountains is high altitude spruce-fir forest and alpine tundra. (See *U.S. National Atlas,* vegetation map: A. W. Kuchler, ed., 1967.) *Sorex monticolus* confronts S. *vagrans* as low as 3,000 ft. in mid-altitude forests of Douglas fir, lodgepole pine, western larch, and grand fir (Fig. 3). It may descend to pinyon-juniper woodland on the northern end of the Great Basin, but except for the Ruby Range has not been collected from the mountains of central Nevada (see Brown, 1971). It occurs along streams and rivers in the high prairie east of the Con-

tinental Divide (where *vagrans* does not occur) and on isolated mountain ranges of central Montana and Wyoming, whose forests are of the same type as those of the Rocky Mountains. No *monticolus* have been collected from the pine forests of eastern Montana and Wyoming, and western South Dakota.

The incisor tine/pigment configurations we discovered in S. *monticolus obscurus* is characteristic also of the subspecies *alascensis, bairdi, mixtus, monticolus, parvidens, permilliensis, setosus, shumaginensis,* and *soperi.* Except for *monticolus,* these forms were previously described as subspecies of "*Sorex obscurus.*" *S. m. monticolus* was confused by Merriam (1895) and Jackson (1928) with *Sorex vagrans* from the northern Rockies. As Findley recognized (1955a), populations of *S.m. monticolus* from New Mexico, Arizona, Chihuahua and Durango appear to represent a southern offshoot of *S. m. obscurus* from the central Rockies. *Sorex durangae,* which Jackson (1928) viewed as ". . . in many respects similar to *S. obscurus* . . ." is also a synonym of *Sorex m. monticolus;* its skull and teeth are virtually indistinguishable (see Fig. 5J). It is not assignable to *Sorex saussurei* as Findley thought (1955b).

The few specimens of the race *neomexicanus* that we examined showed a somewhat aberrant tooth pattern, the accessory tines being very small to nearly absent; however, the general pattern is that of *monticolus* rather than *vagrans.* James Findley (pers. comm.) checked all specimens of *neomexicanus* at the University of New Mexico and found none in which accessory tines were entirely lacking.

Findley's subspecies *longiquus* and *obscuroides* do not, in our opinion, deserve recognition apart from *S. monticolus obscurus.* The three forms are identical in tooth structure. Findley (1955a:49) distinguished *longiquus* from *obscurus* mainly because of its small size. However, Figure 4 shows that specimens of *S. m. obscurus* from south and west of the Snake River and from central Montana outside the range of *longiquus* are, on the average, even shorter than the three Findley topotypes of *longiquus.* This is consistent with Mezhzherin's hypothesis (1964) discussed earlier. On the other hand, cranial measurements of several *longiquus* in Findley's report (1755a:64) fell below minimum values we noted in populations of typical *obscurus.* Further data are needed, but "*Sorex vagrans longiquus*" probably represents no more than a cluster of ecotypic variants of *S. monticolus obscurus,* similar to isolated montane populations from the northern edge of the Great Basin.

Similarly, Findley distinguished "*S. vagrans obscuroides*" as smaller, and ". . . separated from the range of *obscurus* by the intervening smaller subspecies *S. v. vagrans.*" (1955a:58). However, Sierra Nevada populations of *monticolus* are no smaller in size than small *S. m. obscurus* (see above), and are not as isolated geograph-

ically as Findley indicated (Fig. 3). *Sorex monticolus obscurus* appears to have reached the Sierra Nevada somtime during the Wisconsin glacial period. Martin (1958) noted that during the height of the Wisconsin the southwestern spruce-fir forest zone was displaced downward 4,000-5,000 ft. in southern New Mexico (and probably most of the southwest). Spruce pollens from this period have been found as far south as the Valley of Mexico. During this time *monticolus* and *vagrans* probably moved through continuous forest far into Mexico, giving rise to *S. m. monticolus* in the mountains of Chihuahua and Durango. As noted above, *S. vagrans orizabae* appears to be a relict of similar origin.

A similar corridor of boreal forest must have spanned the southern rim of the Great Basin, allowing *monticolus* access to the Sierra Nevada from southern Utah; Major and Bamberg (1967) presented floristic evidence for such a dispersal corridor. *Sorex lyelli*, a relative of *S. cinereus*, and subspecies of *Eutamias umbrinus* and *Phenacomys intermedius*, may have reached California by this pathway, and *Sorex nanus*, in the *ornatus* group, seems to have moved *into* the Rocky Mountains from west to east. Findley believed "*obscuroides*" to be an offshoot of *S. vagrans vagrans*, but every specimen of California *S. m. obscurus* examined bears the distinctive incisor pattern of *Sorex monticolus*. *Sorex monticolus parvidens*, a rare shrew from the San Bernardino Mountains, California, also appears to be an isolated offshoot of *S. m. obscurus*. It may also occur in the Piute and Tehachapi mountains, between the known range of *S. m. parvidens* and the southernmost records of *S. m. obscurus* in the Sierra Nevada (Fig. 3, question marks). The few specimens from these isolated intermediate mountain ranges available to us (USNM 135947-48; 159416-17) appear to be closer to *S. monticolus* than to *S. ornatus*, to which they are currently assigned. Additional specimens are needed before a decision can be reached.

Populations of *Sorex monticolus* from southeastern Alaska and coastal British Columbia i.e., *calvertensis, elassodon, insularis, isolatus, longicauda*, and *prevostensis*) have a variable incisor pattern which in some specimens is intermediate between those observed for *vagrans* and *monticolus* (Fig. 5E). The color is less intense and the tines are somewhat higher on the face of the tooth than in typical *monticolus*. We have observed somewhat similar patterns in occasional specimens of *Sorex vagrans* (Fig. 5F), and in the related *S. ornatus* (Fig. 5H). They may recall a primitive condition from which the distinctive patterns of *vagrans, monticolus, cinereus* (Fig. 5G), *pribilofensis* (Fig. 5I), and other *Otisorex* shrews diverged. At present these island races assigned to *monticolus* probably maintain a genetic link with interior populations through *S. m. longicauda, S. m. obscurus*, and *S. m. setosus* (Findley, 1955a). Foster (1965) suggested that ancestors of the insular races may have been

isolated from the main body of *monticolus* during the most recent glacial period, on a Queen Charlotte Refugium. The discontinuity in gene flow may have produced or perpetuated the abberant tooth pattern found among *Sorex monticolus* from this region; in some ways this situation parallels the relationship of *Sorex monticolus* and *S. pacificus.*

The validity of the name "obscurus."—Our decision to recognize "*Sorex obscurus*" as a valid species led to the discovery that the names of the two shrews that had been previously considered subspecies of *Sorex vagrans (monticolus, dobsoni)* had priority over the name *obscurus.* Merriam (1890) named *S. monticolus* from specimens collected in the San Francisco Mts., Arizona, and subsequently (1891) described *S. dobsoni* from Alturas (=Sawtooth) Lake, Idaho. By 1895 he had come to regard both as subspecies of *Sorex vagrans.* Jackson (1928) followed Merriam in his definition of *S. vagrans monticola,* but reduced *S. v. dobsoni* to the status of a junior synonym of *monticola,* which he believed to range from northern Mexico to southern British Columbia. However, Findley (1955a), restricted the name *S. v. monticola* to shrews from Arizona, New Mexico, and Chihuahua. He included the northern shrews in the subspecies *S. v. vagrans,* along with the races of *S. v. amoenus and S. v. nevadensis,* formerly recognized by Jackson (1928), and considered that the name *dobsoni* applied to intergrades between *S. v. vagrans* and *S. v. obscurus* in the northern Rockies.

We have examined the holotypes of *Sorex monticolus* and *S. dobsoni.* They are clearly members of the species "*S. obscurus*" *(sensu* Jackson, 1928). The earliest valid description is that of *S. monticolus* Merriam, 1890; *Sorex dobsoni* Merriam, 1891, and *S. obscurus* Merriam, 1895, are junior synonyms of *S. monticolus.*

The name *dobsoni* has priority over *obscurus* as the name for the Rocky Mountains subspecies of the dusky shrew; i.e. "*S. obscurus obscurus*" (sensu Jackson, 1928). However, we choose to consider *dobsoni* a *nomen oblitum* (cf. Art. 23b, International Code of Zoological nomenclature, 1964: 23). The code provides that a name may be considered "forgotten" if it has remained unused as a senior synonym in the primary taxonomic literature for more than fifty years. The name *dobsoni* has been applied incorrectly to *Sorex vagrans* since 1895; Jackson (1928) made it a junior synonym. The name *Sorex obscurus* on the other hand was applied correctly and consistent with its type from 1895 to 1966, when it was made a synonym of *Sorex vagrans* (Findley, 1955a). It is still widely known and used. *Obscurus* is no longer a valid species name, but to discard it as a name for the subspecies in favor of *dobsoni* would cause a great deal of unnecessary taxonomic confusion. We therefore employ the name-combination *Sorex monticolus obscurus.*

Sorex pacificus Coues, 1877
Pacific Giant Shrew

Sorex pacificus Coues, 1877:650. (Type locality, Ft. Umpqua, Douglas Co., Oregon).
Sorex yaquinae Jackson, 1918:127. (Type locality, Yaquina Bay, Lincoln Co., Oregon).
Sorex pacificus yaquinae V. Bailey, 1936:364. (New Combination).
Sorex vagrans pacificus Findley, 1955:34. (New Combination).
Sorex vagrans yaquinae Findley, 1955:34. (New Combination).

Holotype.—Adult, sex unknown, skin and skull; USNM 3266, from Ft. Umpqua, mouth of Umpqua R., Douglas Co., Oregon.

Range.—Three subspecies occupy humid to dry coniferous and mixed evergreen forests in coastal Oregon and California, often to high altitude on the western flanks of the southern Cascades (Fig. 2). *Sorex pacificus yaquinae* ranges south from about the Siletz and McKenzie Rivers (near Albany and Eugene), where it may hybridize with *S. monticolus bairdii* (and *S. m. permilliensis*?), to the Umpqua River on the coast and inland to the Siskiyou Mountains on the California border. *Sorex pacificus pacificus* is confined more closely to coastal forests, from the mouth of the Umpqua River in Oregon, inland to the western Siskiyous, and south as far as Mendocino, California. *Sorex pacificus sonomae* continues south in the redwood forests nearly to the Golden Gate.

Diagnosis.—Medium to large sized shrews of the subgenus *Otisorex*, more similar to *S. monticolus* than to *S. vagrans*. As in *vagrans* and *monticolus* the third unicuspid tooth is smaller than the fourth, and the foramen magnum is situated more or less ventrally (Findley, 1955a). Pigment on the first upper incisors is extensive and dark, but there are typically *no* medial tines (Fig. 5C). Some specimens of *S. p. yaquinae*, in the zone of contact with *S. monticolus bairdii* have tiny tines suggesting the typical *monticolus* pattern (Fig. 5D).

Size varies north to south and from the coast inland; the largest *pacificus* are on the coast in southwest Oregon and northwestern California. For example, three *S. p. pacificus* from near Gold Beach, Oregon, had total lengths of 155-163 mm, and condylobasal lengths of 22.3-22.8. Eight *S. p. pacificus* from near Happy Camp, inland from the coast (Siskiyou Co., California), were 134-149 mm long, with condylobasal length 21.2-21.9 mm. Five specimens of *S. p. yaquinae* from Newport, Oregon (near the type locality), were 128-141 mm long, with condylobasal length 19.3-20.5; specimens in the zone of contact with *S. monticolus bairdii* are even smaller. See Findley (1955a) for details of size and color variation.

Remarks.—The three subspecies of *Sorex pacificus* are larger than any of the races of *S. monticolus*. Normally there are no tines

on the upper incisors, although the pigment is high and very dark (Fig. 5C). Specimens assigned to *S. p. yaquinae* from Taft and Philomath, Oregon (near localities from which *S. monticolus bairdi* have been collected) have traces of medial tines which suggest that *pacificus* may hybridize with *Sorex monticolus* (Fig. 5D). Incisor structure varies in populations of *S. m. bairdi* and *S. m. permilliensis* which approach *yaquinae* in central Oregon, but father north (e.g., Astoria, Portland, Tillamook) *S. m. bairdi* consistently shows large, low tines and heavy pigment characteristic of *S. monticolus*. From his studies of the biology of *bairdi* and *yaquinae*, Chris Maser (pers. comm.) concurs with Findley (1955a) that the cline in body size between *Sorex monticolus* and *S. pacificus* represents genic introgression, the nature of which is poorly understood. The ancestors of *S. pacificus* were probably isolated from typical *monticolus* during the Wisconsin glaciation, and limited gene flow may have been reestablished with subsequent post-glacial contact.

Brown (1970, 1974) has done preliminary work on the chromosomes of *Sorex vagrans*, *S. monticolus*, *S. pacificus*, *S. ornatus*, and *S. sinuosus* from the coastal region of California, Oregon, and Washington. The normal diploid number in all species is 54, with three small pairs of metacentric autosomes. Variation occurs in the number of submetacentric and acrocentric autosomes. *Sorex ornatus* and *S. sinuosus* consistently have 18 (9 pairs) of submetacentrics (47 specimens from nine localities in central California). *Sorex vagrans* varies, from 6 submetacentrics (3 pairs) in the San Francisco Bay region (3 specimens of *S. v. vagrans;* 1 of *S. v. halicoetes*) to 4 (2 pairs) in northern California and Oregon (7 specimens from four localities). Karyotypes from *Sorex monticolus* and *S. pacificus* show a north to south decline in numbers of submetacentric autosomes, this cline paralleling the morphological intergradation described by Findley (1955a). *Sorex monticolus setosus* has 4 to 5 submetacentrics (5 specimens from two localities), and *S. m. bairdi* has 2 or 4 (4 specimens from two localities). *S. pacificus yaquinae* has 0 or 1 submetacentrics (11 specimens from 3 localities) as does *S. m. permiliensis* (6 specimens from 1 locality) and *S. p. pacificus* appears to have no submetacentrics (but only one specimen was examined).

More intensive work needs to be done to substantiate these trends, and to determine the extent of gene exchange between *Sorex p. yaquinae* and *S. m. bairdi* and between *bairdi* and *permilliensis* south of, and *setosus* north of the Columbia River. If there are no substantial reproductive barriers between the taxa another nomenclatoral change will be necessary as *Sorex pacificus* Coues, 1877, has priority over *S. monticolus* Merriam, 1890. For the present the evidence is not sufficient to justify further revision.

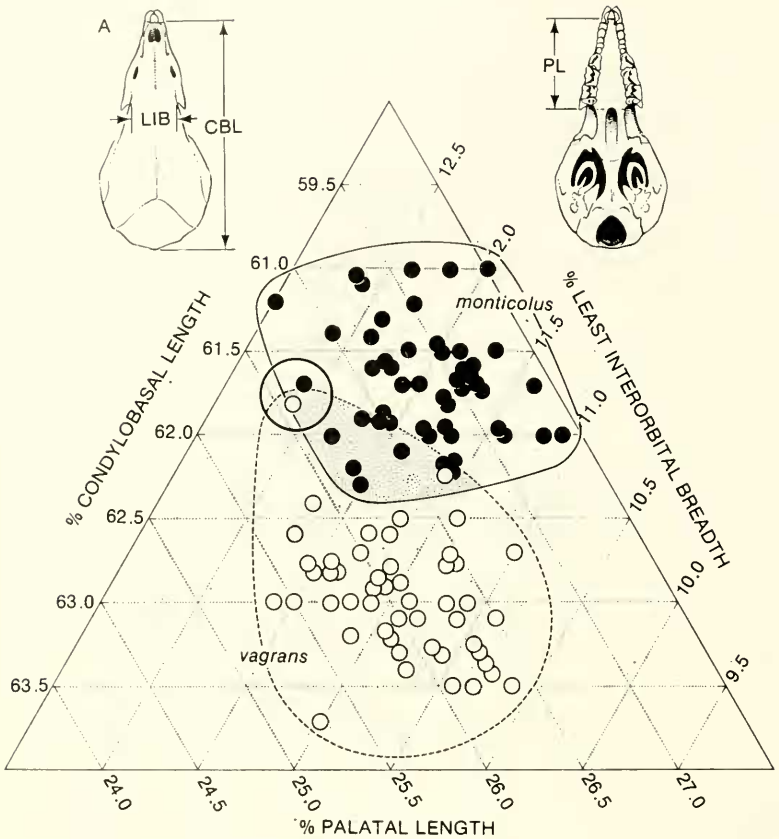


FIG. 7—(A.) Dorsal (left) and ventral (right) views of skull of *Sorex monticolus obscurus* (KU 28545), from northern British Columbia, showing the three measurements in millimeters, used in Figs. 6 and 7. CBL, condylobasal length; LIB, least interorbital breadth; PL, palatal length. (Redrawn from Findley, 1955a.) Approx. × 3/4; and (B.) Trivariate analysis of cranial proportions in 50 *S. v. vagrans* from eastern Washington and western Montana, and 50 *S. m. obscurus* from western Montana and the Beartooth Plateau (NW Wyoming). The two specimens darkly circled have "hybrid" skull characteristics. Both are from areas of parapatry or sympatry, the *vagrans* from Camas Cr., Glacier National Park, Mont., and the *obscurus* from Three-Mile Cr., Sapphire Range, Ravalli Co., Mont.

DISCUSSION

Although *Sorex vagrans* and *Sorex monticolus* are sympatric over major portions of their ranges, close study reveals that they tend to occupy different microhabitats, and only rarely are they collected at the same trap site. In western Montana *S. v. vagrans* is largely a shrew of riparian habitat, ranging widely along watercourses throughout the intermountain region. Its ability to survive at

high altitudes, on dry soils, and in boreal forests, appears limited. In Montana the Continental Divide may limit the eastward expansion of its range. *Sorex monticolus obscurus* ranges more widely through montane forests, is less dependent on water, and is found at high altitudes and on dry acidic soils. Where *vagrans* and *monticolus* occur together in the lowlands of western Montana (3,000-5,000 ft.), we found *monticolus* much less common than *vagrans*. In British Columbia, Hawes (1975) reported biological and ecological differences, including odor (Hawes, 1976), between S. *v. vagrans* and S. *m. setosus* which are consistent with our observations, as has Terry (1974) in western Washington.

Of all the shrews examined from western Montana, only one or two specimens has the blend of *vagrans* and *obscurus* characters one would expect of a hybrid (see Fig. 7B). Hybridization *per se* is not uncommon in mammals (Mayr, 1963); it does not follow that hybrids are fertile, or that backcrossing into the parent populations is also occurring. We see no morphological evidence in Montana of broad intergradation cited by Findley when he synonymized *Sorex obscurus (=monticolus)* with S. *vagrans*. Moreover, S. *v. vagrans* differs from S. *monticolus* and S. *pacificus* in that the two largest metacentric pairs of chromosomes are subequal in size in the latter whereas in *vagrans* one is considerably larger than the other; neither is the morphology of the submetacentric chromosomes completely comparable (Brown, 1974).

Findley also inferred that intergradation between *vagrans* and *monticolus* occurred along the Wasatch Front in Utah and the Donner Pass region in the Sierra Nevada of California. Almost all of the specimens we examined from these areas are clearly either S. *vagrans* or S. *monticolus*, even when the two occur at the same localities. However, a few "hybrid" tooth patterns (Fig. 5F) were found in specimens from Nevada Co. (Boca Springs; Donner; Independence Lake), and Plumas Co. (Spring Garden Ranch, Grizzly Mts.) in central California, while in Utah, possible hybrids were found in Davis Co. (Clearfield), Salt Lake Co. (Parley's Canyon, 5000′; Spring Run, 4400′), and Weber Co. (2 mi. W. Roy P. O.; Snow Basin). We also identified possible hybrid specimens from Anthony, Oregon, and southeast of Pocatello, Idaho.

In California *Sorex monticolus* is limited to the continuously mountainous central and southern Sierra Nevada. Of all the potential "hybrid" individuals, a single specimen (from Spring Garden Ranch, Plumas Co., California) more closely resembles *monticolus* than *vagrans* in the shape and placement of the accessory tines, and is so assigned. This place is separated from montane habitats around Mt. Lassen and Mt. Shasta by deep canyons and broad stretches of lowland forest. Nonetheless, a few shrews from the lowlands between Mt. Shasta and Mt. Lassen (Shasta Co.: Cassel;

Siskiyou Co.: Medicine Lake, and Wagon Camp), where *vagrans* is common but no *monticolus* have been collected, also have incisors conforming to the "hybrid" pattern (Fig. 5F), and Jackson (1928) thought that *obscurus (=monticolus)* inhabited the northern Sierra Nevada. (His northernmost record, at McCloud River, Siskiyou Co., was a misidentified *Sorex trowbridgii*.)

The "hybrid" pattern, wherever it occurs, is reminiscent of *monticolus* only because the tines are larger and the pigment higher than is characteristic for *Sorex vagrans*. But the pattern is in other ways essentially *vagrans* (compare Figs. 5A1 and F); the shape and placement of tines in *monticolus* is markedly different (see Fig. 5B1). We conclude that the hybrid patterns are actually character convergence – the product of genetic drift or selective factors operating within local populations of *Sorex vagrans*. The available evidence demonstrates no intergradation between *vagrans* and *monticolus*.

Rudd (1955b) documented a range of gradation in color and morphology of salt marsh shrews in the northern part of San Francisco Bay, which he believed to represent introgression between *Sorex vagrans* and S. [*ornatus*] *sinuosus*. However, Brown (1970) examined the karyotypes of these shrews and found that all 13 individuals of the so-called hybrid population at Tolay Creek were karyotypically S. *sinuosus* (see above) as were 10 shrews from the vicinity of Petaluma Creek which Rudd had regarded as S. *v. vagrans*. Character convergence in this case, too, must be accounted for by something other than genic introgression. Pizzimenti (1976) discovered a similar situation among prairie dogs (*Cynomys*).

Findley (1955a) regarded shrews of the S. *ornatus* group (*ornatus, nanus, tenellus*, etc.), S. *longirostris* and S. *veraepacis* as closely related to the *vagrans* group, from which they diverged during the late Pleistocene. Presently, S. *ornatus* is sympatric with S. *vagrans* only in the area around San Francisco and Monterey bays, and with S. *monticolus* only in the San Bernardino Mountains; its incisor tine pattern (Fig. 5H) is closer to that of *monticolus* than *vagrans*, as is that of S. *nanus*, which is broadly sympatric with S. *monticolus* in the central and southern Rocky Mountains. In contrast, S. *longirostris* of the southeastern United Stated, regarded by Findley as "close in many ways to S. *nanus*" (1955a:28), has incisor tines which resemble those of S. *vagrans;* its distribution is wholly allopatric and disjunct from its above-mentioned relatives. These new data mandate re-interpretation of the biogeography and evolution of the *vagrans–ornatus–longirostris–veraepacis* groups, but will require still fuller understanding of the relationships within and between these groups.

Summary

Morphological similarities between *Sorex vagrans vagrans* and *S. monticolus (=obscurus) obscurus* were re-examined. Findley (1955a) interpreted convergence in size and color as evidence of introgression, and redefined the species *Sorex vagrans* to include also *S. obscurus*, *S. pacificus*, and *S. yaquinae (sensu* Jackson, 1928). In this paper we describe differences in tooth morphology and cranial proportions, which demonstrate more clearly than past criteria the integrity of *S. vagrans* and *S. monticolus*, and to a certain extent, that of *S. pacificus*. The name *Sorex monticolus* Merriam, 1890, takes priority over *S. obscurus* Merriam, 1895. The latter is conserved as a subspecies name; *Sorex dobsoni* Merriam, 1891, is considered a *nomen oblitum*.

Sorex vagrans and *S. monticolus* are biologically and ecologically distinct, although their ranges overlap extensively. There is no evidence that character convergence in some localities represents genic introgression, although occasional hybrids may occur.

Secondary introgression may occur between *Sorex monticolus* and *S. pacificus*, but they should be recognized as distinct species until further research clarifies their relationship to each other.

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Appendix: Specimens Examined

Locality data for each specimen examined are arranged as follows: alphabetically by species and subspecies; by state or province, county and locality; alphabetically by museum abbreviation. Asterisks indicate specimens included in statistical analysis of cranial measurements.

Sorex monticolus

S. *monticolus alascensis*. Total number, 65.—ALASKA: head of Cordova Inlet, 1 MVZ; Disc Is., 1 MVZ; Douglas Is., 0.5 mi N of bridge (near Juneau), 1 MVZ; Eleanor Is., 1 MVZ; Glacier Bay Nat. Monument (58°22′-26′N, 136°52′-54′W), 14 CT; Glacier Bay Nat. Monument, Bartlett Cove, 2 USNM; Glacier Bay Nat. Monument, Pt. Gustavus, 1 USNM (holotype S. *glacialis*);

4 mi N 9 mi W Haines, Chilkat R., 100′, 9 KU; 1 mi S Haines, 5′, 10 KU; 1 mi SSE Haines, 10′, 2 KU; Juneau, Sheep Cr., 2 UM; Knight Is., Drier Bay, 1 MVZ; Muir Inlet, Nunatak Camp, 1 USNM; Prince William Sound, Orca, 1 USNM; Seward, 4 USNM; NE end Sullivan Is., 8 KU; Valdez, Sawmill Bay, 1 USNM; Yakutat Bay, 3 USNM (incl. holotype); no exact locality, 2 USNM.

S. monticolus bairdii. Total number, 86.—OREGON: *Clackamas Co.:* Arra Wanna, near Mt. Hood, 1 MVZ; 1.75 mi SW Colton, 1 MVZ; Estacada, 1 KU, 1 MVZ; Lake Grove, 10 mi SW Portland, 1 UM; *Clatsop Co.:* Astoria, 5 MVZ, 12 USNM (incl. holotype); Old Fort Clatsop, 100′, 5 MVZ; Seaside, 3 USNM; *Columbia Co.:* 3 mi SW Rainier, 500′, 1 MVZ; 7 mi SE Rainier, 100′, 12 MVZ; *Deschutes Co.,* McKenzie Pass, 1 USNM; *Deschutes or Lane Co.:* N slope, Three Sisters, 4 USNM; *Lane Co.:* Blue R., 1 USNM; McKenzie Bridge, 1 USNM; Vida, 6 USNM; *Lincoln Co.:* Delake (=Lincoln City), 1 KU; Lincoln Beach, 2 USNM; Otis, 10 USNM; Rose Lodge, 1 USNM; Siletz R., 1 USNM; *Multnomah Co.:* Larch Mt., 1 USNM; Portland, 3 USNM; *Tillamook Co.,* Tillamook, 2 KU, 2 MVZ, 2 USNM; 5 mi WNW Timber (in Washington Co.), 2200′, 1 UM; 7 mi WNW Timber (in Washington Co.), 2100′, 1 UM; *Washington Co.:* 18.5 mi WNW Portland, 1300′, 3 MVZ.

S. monticolus calvertensis. Total number, 4.—BRITISH COLUMBIA: Safety Cove, Calvert Is., 2 USNM (topotypes); Calvert Is., 2 UBC.

S. monticolus classodon. Total number, 21.—ALASKA: Admiralty Is. (3 localities), 8 MVZ; Duke Is., 1 MVZ; Forester Is., 2 MVZ, 7 CAS-SU; Mitkof Is., 2 USNM; BRITISH COLUMBIA: Queen Charlotte Islands, Moresby Is., Cumshewa Inlet, 1 USNM (holotype).

S. monticolus insularis. Total number, 2.—BRITISH COLUMBIA: Smythe Is., 2 USNM (topotypes).

S. monticolus isolatus. Total number, 21.—BRITISH COLUMBIA (Vancouver Island): Alberni, 1 MVZ; Comox, 1 USNM; Errington, 1 MVZ; French Cr., 1 MVZ; Golden Eagle (Mine), 1 MVZ; Goldstream, 1 MVZ, 5 USNM; Little Qualicum R., 1 MVZ; Nanaimo, 4 USNM (incl. holotype); Parksville, 1 MVZ; Quatsino, 1 USNM; Saturna Is., 2 MCZ; Mt. Washington, 1 KU.

S. monticolus longicauda. Total number, 18.—ALASKA: Bocade Quadra, 1 MVZ; Bradfield Canal, 1 MVZ; Chickamin R. (Behm Canal), 1 MVZ; Etolin Is., 1 MVZ: Gravina Is. (opp. Ketchikan), 1 MVZ; Helm Bay, 1 MVZ; Wrangell Is., Polk Point, 1 CAS; Wrangell Is., Wrangell, 6 CAS, 1 USNM (holotype); BRITISH COLUMBIA: B Is., Hunter group, 1 UBC; Port Simpson, 2 USNM; Ruth Is., 1 UBC.

S. monticolus malitiosus. Total number, 5.—ALASKA: Coronation Is., Egg Harbor, 3 MVZ; E side Warren Is., 2 MVZ (incl. holotype).

S. monticolus mixtus. Total number, 3.—BRITISH COLUMBIA: Texada Is., Vanada, 3 MVZ (incl. holotype).

S. monticolus monticolus. Total number, 59.—ARIZONA: *Apache Co.:* Springerville, 1 USNM; Tunitcha Mts., Spruce Cr., 8 USNM; White Mts., 10 USNM; White Mts., Mt. Thomas, 9 USNM; *Cochise Co.:* Chiricahua Mts., Fly Park, 4 USNM; *Coconino Co.:* San Francisco Mts., 3 USNM (incl. holotype); *Graham Co.:* Graham Mts., 9200′, 2 USNM; *Greenlee Co.:* Prieto Plateau, 9000′, S end Blue Range, 1 USNM; *Pima Co.:* Santa Catalina Mts., 7500′, Summerhaven, 3 USNM; CHIHUAHUA: Sierra Madre, near Gaudalupe y Calvo, 5 USNM; DURANGO: El Salto, 2 USNM (incl. holotype *S. durangae*); 5 mi S El Salto, 1 MCZ; Cueva, 8 mi S El Salto, 1 MSU; NEW MEXICO: *Catron Co.:* Mogollon Mts., 3 USNM; 10 mi E Mogollon, 1 KU; *San Juan Co.:* Chusca Mts., 1 USNM; *Sierra Co.* Mts. 4 mi W Kingston, 1 USNM; *Socorro Co.:* Magdalena Mts., Copper Canyon, 3 USNM.

S. monticolus neomexicanus. Total number, 19.—NEW MEXICO: *Otero Co.:* SW slope Capitan Mts., 2 USNM; Clouderoft, 10 MCZ, 7 USNM (incl. holotype).

S. monticolus obscurus. Total number, 903.—ALASKA: Anaktuvuk Pass, 4 USNM; Bettles, 66°04′N, 151°34′W, 671′, 1 KU; Chandler Lake, 68°12′N, 152°45′W, 2900′, 1 KU; Chilkat Valley, Wells, 1 USNM; Mts. near Eagle, 1 USNM; Kilikmak Valley, head, Kilikmak Cr., 1 USNM; Noatak Valley, Anuk Lake, 1 USNM; Tanana, 3 USNM; Head, Toklat R., 3 USNM; Wahoo Lake, 69°08′N, 146°58′W, 2350′, 1 KU; Yukon R., 20 mi above Circle, 2 USNM; ALBERTA: Assineau R., 4 mi N 10 mi E Kimise, 2 KU; Blindmans Red R., 1 MCZ; BRITISH COLUMBIA: Atlin, 6 CAS; Barkerville, 7 USNM; Bennett (City), 6 USNM; S branch, Big Salmon R., 1 USNM; Caraboo L., near Kamloops (=Cariboo L. 40 mi N Kamloops), 2 USNM; Chapa-atan R., 4 USNM; Cranbrook, 1 MVZ, 1 USNM; Field, 2 USNM; Ft. Grahame, 3 USNM; Glacier (Nat. Park), 6 USNM; Glenora, 1 USNM; Golden, 1 USNM; Hope, 2 MCZ; Hudson's Hope, 1 USNM; Hot Springs, 3 mi WNW jct. Trout and Liard Rs., 1 KU; 4 mi S 2 mi E Kelsall Lake, W side Mt. Glave, 1 KU; N end Kerry Lake, E bank Crooked R., 3 KU; Klappan R., 2 USNM; Kootenay Nat. Park, Vermillion Crossing, 1 USNM; Laurier Pass, 4 USNM; McDame Post, Dease R., 5 USNM; Mt. Revelstoke Nat. Park, 3 USNM; NW side Muncho Lake, 1 KU; 9 mi S 44 mi W Muskwa, 2 KU; Nelson, 8 USNM; 70 mi E Prince Rupert, 5 USNM; 30 mi N Radium Hot Springs, 2 USNM; Redfern Lake, 1 USNM; Sicamous, 1 USNM; Sikanni Chief R., 6 USNM; Stonehouse Cr., 5.5 mi W jct. with Kelsall R., 3 KU; Tweedsmuir Prov. Park, Fenton Lake, 1 UM°; Tweedsmuir Prov. Park, NE end Goodrich Lake, 3 UM°; Wall Lake, 1 USNM; Wind Summit Lake, Mile 393 Alaska Hwy., 1 KU; Yale District, 7 mi W Bridesville, Anarchist Mtn., 400′, 1 MVZ; CALIFORNIA: *Eldorado Co.:* China Flat, Rockbound Valley, 7800′, 1 MVZ; Echo (Lake), 4 MCZ; Gilmore Lake, Mt. Tallac, 1 MVZ; 1 mi E Phillips, 1 MVZ; *Fresno Co.:* Horse Corral Meadows, 3 USNM; Humphreys Basin, 10800′, 1 MVZ; Kea(r)sarge Ledges, Kea(r)sarge Basin, 11500′, 2 KU; *Inyo Co.:* 3 mi S 8 mi W Big Pine, 7700′, 1 MVZ; 7 mi W Big Pine, 7000′, 2 CSLB; 10 mi W Big Pine, Big Pine Cr., 8000′, 1 MVZ; 11 mi SW Big Pine, 9000′, 1 CSLB; S Fork Big Pine Cr., ca. 10800′, 1 CAS; Bishop Cr., 6600′, 5 USNM (incl. holotype *S. obscuroides*); 5 mi W 1.25 mi S Independence, 6000′, 1 MVZ; Inyo Nat. For., Sage Flat Camp, 7700′, 1 CSLB; *Madera Co.:* San Joachin R., 8000′, 3 USNM; *Mariposa Co.:* Lake Tenaya, 3 USNM; Tuolomne Meadows, 5 mi N base Mt. Lyell, 8 USNM; Tuolumne Meadows, Muir Meadow, 9300′, 1 USNM; Tuolomne Meadows, Soda Springs, 3 USNM; Tuolumne Meadows, Mt. Unicorn, 1 USNM; Tuolomne Meadows, 2 USNM; *Mono Co.:* Mt. Conness, 1 USNM; Mt. Dana, 6 USNM; Lake Mary, 9000′, 7 CAS; Lee Vining, 1 MVZ; Mt. Lyell, 12 USNM; Mammoth, 2 MCZ, 1 USNM; Pine City, near Mammoth, 8700′, 1 MVZ; Pine City, 9000′, 1 USNM; *Nevada Co.:* Independence Lake, 1 MVZ; *Placer Co.:* Donner, 1 USNM; *Plumas Co.:* Spring Garden Ranch, Grizzly Mts., 1 USNM; *Tulare Co.:* Kern Lakes, 1 USNM; N fork, Kern R., 9600′, 2 USNM; S fork, Kern R., 4 USNM; Mineral King, 2 USNM; Moltkes Meadows, 9000′, 1 USNM; W slope Olancha Peak, Little Brush Meadow, 9750′, 1 MVZ; Round Valley, 12 mi S Mt. Whitney, 1 USNM; Sequoia Nat. Park, Cahoon Meadow, 1 USNM; Sequoia Nat. Park, Halstead Meadows, 4 USNM; Sequoia Nat. Park, E fork Kaweah R., 7 USNM; Sequoia Nat. Park, Round Meadow, 1 USNM; 3 mi SE Three Rivers, 2 CSLB; Mt. Whitney, 2 MCZ, 6 USNM; *Tuolumne Co.:* 0.5 mi NW Sonora Pass, 9400′, 1 MVZ; COLORADO: *Boulder Co.:* 0.75 mi N 2 mi W Allenspark, 8400′, 5 KU; 3 mi S Ward, 9000′, 1 KU; *Chaffee Co.:* Poncho Cr., 10 mi SW Salida, 8500′, 5 KU; *Conejos Co.:* 5 mi S 24 mi W Antonita, 1 KU; *Delta Co.:* 12 mi S 5.5 mi E Collbran, Grand Mesa, 10400′, 4 KU; 0.5 mi S 8 mi E Skyway, Grand Mesa, 10000′, 2 KU; 1 mi S 8 mi E Skyway, Grand Mesa, 10200′, 1 KU; 1.5 mi S 8 mi E Skyway, Grand Mesa, 9500′, 3 KU; 2 mi S 8 mi E Skyway, Grand Mesa, 9500′, 2 KU; *Dolores Co.:* T40N R13W Sec 13, 8100′, 1 KU; *Garfield Co.:* Deep Lake, 16

mi N Glenwood Springs, 3 KU; *Gunnison Co.:* Gothic, 1 UM; 1.5 mi N Gothic, 7 KU; 9 mi WNW Sapinero, Black Mesa, 9500′, 1 KU; *Huerfano Co.:* 4 mi S Cucharas Camps, 3 KU; 5 mi S 1 mi W Cucharas Camps, 10000′, 10 KU; *Jackson Co.:* 2 mi N 2 mi E Gould, 8600′, 1 KU; *Lake Co.:* Halfmoon Cr., 8 mi SW Leadville, 10000′, 3 KU; 12 mi S 1 mi W Leadville, 1 KU; 3 mi W Twin Lakes, 2 KU; *Larimer Co.:* 3.5 mi S 4 mi W Estes Park Village, 2 KU; Poudre R., 1 KU; *Mineral Co.:* 23 mi S 11 mi E Creede, 9300′, 1 KU; 4 mi S 6 mi E Wagon Wheel Gap, 8500′, 1 KU; *Montrose Co.:* 13 mi N 7 mi E Norwood, 8400′, 1 KU; T48N R14W Sec. 11 (SE ¼), 9000′, 2 KU; *Montezuma Co.:* 1 mi W Mancos, 7000′, 1 KU; Mesa Verde Nat. Park, upper well, Prater Canyon, 7575′, 2 KU; Mesa Verde Nat. Park, .25 mi. N middle well, Prater Canyon, 7575′, 2 KU; Mesa Verde Nat. Park, Morefield Canyon, 7600′, 2 KU; *Rio Blanco Co.:* 9.5 mi SW Pagoda Peak, 7700′, 2 KU; *Saguache Co.:* Cochetopa Pass, 33 mi W Saguache, 10000′, 3 KU; 3 mi N 16 mi W Saguache, 8500′, 2 KU; IDAHO: *Adams Co.:* 0.5 mi E Black Lake, 6800′, 1 KU; 3 mi W Payette Lake, 5400′, 1 MVZ; SW slope, Smith Mt., 1 mi N Bear Cr. R. S., 5400′, 1 KU; summit, Smith Mt., 7500′, 2 KU; *Bannock Co.:* 4 mi S Pocatello, Indian Cr., 6500′, 1 MVZ; *Blaine Co.:* Alturas (=Sawtooth) Lake, 7000′, 1 MVZ, 1 USNM (holotype S. *dobsoni*); Perkins Lake, 7000′, 1 KU; Sawtooth City, 5 USNM; *Bonneville Co.:* 10 mi SE Irwin, 2 USNM; *Boundary Co.:* Cabinet Mts., E of Priest Lake, 1 USNM; *Boise Co.:* Bald Mt. R. S., 10 mi S Idaho City, 7400′, 2 USNM; *Bear Lake—Caribou Co.* Line: Preuss Mts., head of Crow Cr., 1 USNM: *Cassia Co.:* 10 mi S Albion, Mt. Harrison, 1 MVZ; *Custer Co.:* Head of Pahsimeroi R., Pahsimeroi Mts., 1 MVZ, 1 USNM; *Fremont Co.:* 17 mi E 4 mi N Ashton, 6275′, 9 MVZ; 7 mi W West Yellowstone, 7000′, 4 KU; *Idaho Co.:* 6 mi SW Selway Falls, 5890′, 1 CAS; Seven Devils Mt., 1 USNM; *Lemhi Co.:* "Salmon R. Mts." (=Lemhi Mts.), 6 USNM; Timber Cr., Lemhi Mts., 8200′, 1 USNM (holotype S. *obscurus); Shoshone Co.:* Enaville, 1 USNM; *Teton Co.:* 3 mi SW Victor; 2 MVZ; *Valley Co.:* Landmark R. S., 10 mi E Warm Lake, 6000′, 1 USNM; *Washington Co.:* SW slope Cuddy Mt., 1 mi NE Heath, 4000′, 8 KU; MONTANA: *Beaverhead Co.:* 18 mi NW Dillon, Birch Cr., 7100′, 6 MVZ; S of Wise River (town), on Wise R., 1 UM; *Broadwater Co.:* 5 mi W Townsend, 2 UM°; *Carbon Co.:* Beartooth Mts., 2 USNM; Pryor Mts., 5 USNM; 2 mi E Shriver, 6500′, 3 MVZ; *Choteau Co.:* Highwood Mts., 13 USNM; 0.5 mi N Arrow Cr. Divide, 5400′, Highwood Mts., 1 KU; *Fergus Co.:* Big Snowy Mts., 1 UM, 4 USNM; Big Snowy Mts., 13 mi W Buffalo Canyon, 2 USNM; Big Snowy Mts., 6400′, 1 mi S Crystal Lake, 1 KU; Big Snowy Mts., N fork Flatwillow Cr., 15 mi S Heath, 1 USNM; Judith Mts., 4600′, 7 mi N 9 mi E Lewistown, 3 KU; Judith Mts., Lime Kiln Gulch, 7 mi NE Lewistown, 1 USNM; Moccasin Mts., 5 mi NW Hilger, 2 USNM; Mocassin Mts., 4500′, Kendall, 1 KU; *Flathead Co.:* Aeneas Peak, 1 UM°, Big Mountain Ski Area (near Whitefish), 1 DCM°; Glacier Nat. Park, Arrow Lake snowshoe cabin, 4000′, 1 MVZ; Glacier Nat. Park, Logan Pass, 7000′, 4 UM°; Moran R. S. (N fork Flathead R.), 2 UM°; 2 mi S 1 mi W Summit, 5000′, 1 KU; Upper Stillwater Lake, 1 USNM; *Gallatin Co.:* 5 mi N Bozeman, 1 MSUDZ°; 5 mi NE Bozeman, 1 MSUDZ°; Bridger Range, Fairy Lake Camp, 1 UM°; W fork, W Gallatin R., 4 USNM; Upper Hyalite Cr., Palace Butte Camp, 3 UM°; *Glacier Co.:* 1.5 mi S 2.5 mi W Babb, 4700′, 1 KU; 3 mi SW Babb, N bank Swiftcurrent Cr., 4700′, 2 UM°; 1 mi W Cut Bank, 3650′, 1 KU; Glacier Nat. Park, Crossley Lake, 1 USNM; Glacier Nat. Park, Cut Bank (Campground), 1 UM°; Glacier Nat. Park, Gunsight Lake, 2 USNM; Glacier Nat. Park, Many Glacier, 4900′, 2 UM; Glacier Nat. Park, McDermitt Lake, 1 USNM; Glacier Nat. Park, Rising Sun (Campground), 2 UM°; Glacier Nat. Park, 2.5 mi N 2.5 mi W Two Medicine Chalet, 7000′, 1 MVZ; St. Marys Lake, 9 USNM; *Granite Co.:* 1.2 mi W Bearmouth, 1 UM°; *Hill Co.:* Bear Paw Mts., 20 mi. SE Ft. Assini-

boine, 2 USNM, *Jefferson Co.:* 0.5 mi E Whitehall, 1 UM; *Judith Basin Co.:* 3 mi W Geyser, 4100′, 1 KU; Little Belt Mts., Dry Wolf Cr., 20 mi SW Stanford, 1 USNM; Little Belt Mtns., Hoover Spring, 1 UM; Little Belt Mts., Neihart, 1 USNM; Little Belt Mts., Otter Cr., 10 mi SW Geyser, 1 USNM; Little Belt Mts., Sheep Cr., 16 mi N White Sulphur Springs, 1 USNM; Little Belt Mts., Trask Gulch, 2 UM; *Lake Co.:* Flathead Lake, Yellow Bay, UM Biol. Sta., 2900′, 3 UM°; Yellow Bay Cr., 3000′, 1 UM°; 3.5 mi E UM Biol. Sta., 5600′, 4 UM; 4 mi W Ronan, 1 UM°; *Lewis and Clark Co.:* Rogers Pass, 5600′, 1 MSUDZ; Steeker's Camp, Sun R., 2 UM; *Madison Co.:* Ruby Mts., Hinch Cr., 12 mi SW Alder, 4 USNM; Ward Peak, Washington Cr., 6000′, 1 USNM; *Meagher Co.:* Camas Cr., 4 mi S Ft. Logan, 7 USNM; Little Belt Mts., N fork Smith R., lower Sawmill Cr., 1 UM; *Missoula Co.:* Lubrecht Exp. Forest, 1 UM°; Missoula, Miller Cr., 1 UM°; Missoula, Pattee Canyon, 1 UM°; *Park Co.:* 2 mi NE Cooke, 8500′, 6 MVZ; Emigrant Gulch, 3 mi SE Chico, 6500′, 2 USNM; 12 mi S Livingston, Pine Cr., Luecock Park Camp, 1 UM; *Phillips Co.:* Zortman, 1 USNM; *Ravalli Co.:* Bass Cr., NW Stevensville, 4000′, 1 USNM; 7 mi W Hamilton, Blodgett Canyon, 1 DCM°; 7 mi N 9 mi E Stevensville, Three-mile Cr., 4500′, 2 UM°; 8 mi S 9 mi E Stevensville, Burnt Fork, 5050′, 2 UM°; 8 mi NE Stevensville, 4000′, 3 USNM; Sula, 1 USNM; *Silverbow Co.:* Fleecer Mt., head Indian Cr., 1 UM; *Sweetgrass Co.:* Crazy Mts., head Big Timber Cr., 4 UM°; *Teton Co.:* 6.5 mi N 17.13 mi W Augusta, 5100′, 1 KU; No exact locality, 1 UM; *Toole Co.:* Sweetgrass Hills, 1 UM; NEVADA: *Elko Co.:* 22 mi N Deeth, Marys R., 5800′, 1 MVZ; Granite Range, headwaters Trout Cr., 1 MVZ; Ruby Mts., S fork Long Cr., 3 KU; Ruby Mts., summit, Secret Pass, 6200′, 1 KU; Ruby Mts., Three Lakes, 4 KU; Ruby Mts., 2 USNM; *Humboldt Co.:* 13 mi N Paradise Valley, 6700′, 1 MVZ; *Ormsby Co.:* Marlette Lake, 8000′, 1 MVZ; 0.5 mi S Marlette Lake, 8150′, 1 MVZ; *Washoe Co.:* Marlette Lake, 8000′, 2 MVZ; 3 mi S Mt. Rose, 2 MVZ; NEW MEXICO: *Colfax Co.:* 1 mi S 2 mi E Eagle Nest, 8100′, 2 KU; *Sandoval Co.:* Jemez Mts., 3 USNM; *San Miguel Co.:* Hoover's Ranch, 20 mi NW Las Vegas, 1 KU; *Santa Fe Co.:* Pecos Baldy, 1100-11700′, 4 USNM; Santa Fe Ski Basin, 1 KU; 5 mi NE Santa Fe, 1 CAS; *Taos Co.:* 3 mi N Red River, 10700′, 1 USNM; Taos, 1 USNM; Twining, 9800-12500′, 6 USNM; *Torrance Co.:* Manzano Mts., 2 USNM; NORTHWEST TERRITORY: Ft. Resolution, Mission Is., 1 USNM; Ft. Simpson, 3 USNM; Nahanni R. Mts., Mackenzie R., 1 USNM; OREGON: *Baker Co.:* Anthony, 4 MVZ, 1 USNM; Bourne, 3 USNM; *Grant Co.:* Beech Cr., 5 USNM; Strawberry Butte, 1 USNM; *Harney Co.:* Diamond, 1 USNM; Steens Mts., 2 MVZ, 1 USNM; Steens Mts., Keiger Gorge, 7500-8000′, 2 USNM; *Hood River Co.:* 2 mi W Parkdale, 1500′, 2 USNM; *Wallowa Co.:* Wallowa Lake, 4800′, 2 MVZ, 3 USNM; Wallowa Mts., S Wallowa Lake, 8100′, 2 USNM; SASKATCHEWAN: Cypress Hills, 10 NMC; Cypress Hills, near Maple Cr., 1 MVZ, 2 NMC; Middle Cr. Res. (SW Cypress Lake), 1 UAMZ; UTAH: *Beaver Co.:* Beaver Mts., Puffer Lake, 3 USNM; *Davis Co.:* Bountiful Canyon, Mueller Park, 1 UU; Kaysville, 1 mi W L.D.S. Will [sp?], 1 UU; Steed's Canyon, Centerville, 1 UU; *Grand Co.:* La Sal Mts., 11000′, 1 USNM; *Iron Co.:* Brian Head (Mammoth Summit), 11000′, 2 MVZ; Parowan Mts., 2 USNM; *Millard Co.:* Richfield, 1 USNM; *Salt Lake Co.:* Big Cottonwood Canyon, Spruces, Camp 67, 1 UU; Brighton, 8700′, 2 UU; Brighton, 8750′, 1 UU; Brighton, 9500′, 1 UU; 1 mi W Brighton, 8600′, 1 UU; 2 mi from Brighton, 8600′, 1 UU; Butterfield Canyon, 1.5 mi above tunnel, 1 UU; Butterfield Canyon, 3 mi SW of tunnel, 7000′, 1 UU; Little Cottonwood Canyon, 1 mi E of mouth, 5500′, 1 UU; Mill Cr. Canyon, The Firs, 7000′, 1 UU; Mill Cr. Canyon, 2 mi E Mill Cr. G. S., 7000′, 1 UU; Mill Cr. Canyon, Wilson's Fork, 8000′, 2 UU; Salt Lake City, 1 USNM; *Sanpete Co.:* Ephraim, 1 USNM; Manti, 3 USNM; *Sevier Co.:* Fish Lake Plateau, 2 USNM; *Summit*

Co.: Holiday Park, 1 MCZ; *Uintah Co.:* Paradise Park, 15 mi N 21 mi W Vernal, 10500′, 3 KU; *Utah Co.:* Aspen Grove, Mt. Timpanogos, 2 BYU; Basal American Fork Cirque, Mt. Timpanogos, 1 BYU; Hidden Lake, Mt. Timpanogos, 1 BYU; Payson Lake, Nebo Mts., 8300′, 1 UU; 1 mi E Payson Lake, Nebo Mts., 8300′, 1 UU; Spanish Fork, 1 mi E BYU Farm, 1 BYU; Spanish Fork Bench, 1 BYU; Timpooneke Basin, Mt. Timpanogos, 4 BYU; *Wasatch Co.:* Lost Lake, 1 BYU; Uinta Forest, Current Cr., 8000′, 1 USNM; *Washington Co.:* Pine Valley Mts., 3-5 mi E Pine Valley; 10 USNM; 1.5 mi E Pine Valley, 6 USNM; WASHINGTON: *Chelan Co.:* Entiat, 1 USNM; Wenatchee, 1 USNM; *Ferry Co.:* 5 mi W Curlew, 2800′, 2 USNM; *Kittitas Co.:* Easton, 10 USNM; 4.5 mi N 6.5 mi W Easton, 1 KU; *Okanogan Co.:* W end of Bauerman Ridge, at tungsten mine, 6800′, 1 USNM; Head, Lake Chelan, 4 USNM; E fork, Pasayten R., 3900′, 1 USNM; Stehekin, 4 USNM; *Pend 'Oreille Co.:* 2 mi N Gypsy Meadows, 2 CRCM*; *Yakima Co.:* Yakima Indian Reservation, Signal Peak, 4000′, 5 USNM; WYOMING: *Albany Co.:* Woods P. O., 1 USNM; *Carbon Co.:* Bridger Pass, 2 USNM; Sierra Madre Mts., S base Bridger Pk., 8900′, 1 USNM; *Johnson-Washaki Co.* Line: Bighorn Mts., 8400-9000′, 3 USNM; *Lincoln Co.:* 10 mi SE Afton, 7500-9000′, 4 USNM; 3 mi W Stanley, 3 USNM; *Park Co.:* Beartooth Plateau, 26 UM*; Beartooth Pass, 0.5 mi N ski tow, 10325′, 1 UM*; Beartooth Plateau, Mont.-Wyo. State Line, 2 UM*; 25 mi S 28 mi W Cody, 6350′, 1 KU; Cooke City Hwy., S Red Lodge, 2 UM*; Cooke City Hwy., Bennet Cr. divide, 10150-10931′, 4 UM*; Cooke City Hwy., Boundary Lake(s), 7 UM*; Cooke City Hwy., opposite Gardner Lake viewpoint, 10500′, 1 UM*; Cooke City Hwy., 0.5 mi N Gardner Lake viewpoint, 10325′, 16 UM*; Cooke City Hwy., 0.75 mi N Gardner Lake viewpoint, 6 UM*; Cooke City Hwy., 5 mi N Gardner Lake viewpoint, 1 UM*; Cooke City Hwy., 6 mi N Gardner Lake viewpoint, 1 UM*; Cooke City Hwy., 7 mi N Gardner Lake viewpoint, 1 UM*; Cooke City Hwy., 0.33 mi S Frozen Lake, 1 UM*; Ishawopa Cr., 19 mi S 19 mi W Cody, 2 KU; Pahaska, mouth, Grinnell Cr., 6300′, 7 USNM; 0.5 mi W Twin Lake Basin, 1 UM; Yellowstone Nat. Park, Blacktail Deer Cr., 6700′, 1 MVZ; Yellowstone Nat. Park, Mammoth Hot Springs, 1 USNM; Yellowstone Nat. Park, Slough Cr., 6300′, 2 MVZ; SW slope Whirlwind Peak, 9000′, 1 KU; *Sublette Co.:* N side Half Moon Lake, 1 KU; 2.5 mi NE Pinedale, 1 KU; 2.25 mi N Pinedale, 1 KU; 31 mi N Pinedale, 8025′, 3 KU; Surveyors Park, 12 mi NE Pinedale, 8000′, 2 USNM; *Teton Co.:* Jackson Hole Wildlife Park, 7 USNM; 2.5 mi NE Moose, 6500′, Bar BC Ranch, 1 KU; 4 mi N Moose, 6750′, Timberland Is., 3 KU; Moran, 6244′, 1 KU; Moran, Lake Emma Matilda, 2 USNM; 1 mi N Moran, 3 USNM; Upper Arizona Cr., N Moran, 2 USNM; 0.25 mi N 2.5 mi E Moran, 6230′, 3 KU; 1 mi E Moran, 4 KU; 2.5 mi E Moran, 1 KU; 3 mi E Moran, 6210′, 1 KU; 3.75 mi E Moran, 6300′, 1 KU; 1 mi S 3.75 mi E Moran, 6200′, 6 KU; Teton Mts., Moose Cr., 6800′, 7 USNM; Teton Pass, above Fish Cr., 7200′, 2 USNM; Whetstone Cr., 3 USNM; Head, Wolverine Cr., 1 USNM; Yellowstone Nat. Park, Old Faithful, 3 USNM; *Uinta Co.:* Evanston, 1 USNM; Ft. Bridger, 6650′, 3 KU; 1 mi N Ft. Bridger, 6650′, 1 KU; 9 mi S Robertson, 8000′, 3 KU; 9 mi S 2.5 mi E Robertson, 8600′, 1 KU; 10 mi S 1 mi W Robertson, 8700′, 3 KU; 10.5 mi S 2 mi E Robertson, 8900′, 1 KU; 13 mi S 1 mi E Robertson, 9000′, 1 KU; 13 mi S 2 mi E. Robertson, 9200′, 1 KU; *Washakie Co.:* 4 mi N 9 mi E Tensleep, 7000′, 2 KU; 5 mi N 9 mi E Tensleep, 7400′, 1 KU; YUKON: 1.5 mi S 3 mi E Dalton Post, 2500′, 1 KU; SW end Dezadeash Lake, 1 KU; McIntyre Cr., 3 mi NW Whitehorse, 2250′, 1 KU.

S. *monticolus parvidens.* Total number, 7.—CALIFORNIA: *San Bernardino Co.:* San Bernardino Mts., Bluff Lake, 7500′, 4 USNM (incl. holotype); Deep Cr., near Lake Arrowhead, 1 CSLB; Summit, 1 USNM; *Los Angeles Co.:* San Gabriel Mts., 0.4 mi W Wrightwood, 6000′, 1 CSLB.

S. *monticolus permiliensis*. Total number, 24.—OREGON: *Hood River Co.:* Brooks Meadow, 9 mi ENE Mt. Hood, 4300′, 1 MVZ; Near timberline, Mt. Hood, 2 USNM; *Marion Co.:* Detroit, 1 USNM; Permilia Lake, W base Mt. Jefferson, 19 USNM (incl. holotype); *Wasco Co.:* Camas Prairie, 12 mi S Mt. Hood, 1 USNM.

S. *monticolus prevostensis*. Total number, 13.—BRITISH COLUMBIA: Queen Charlotte Islands, Prevost Is., 13 USNM (incl. holotype).

S. *monticolus setosus*. Total number 43.—BRITISH COLUMBIA: Howe Sound, Gibson's Landing, 1 USNM; WASHINGTON: *Clallam Co.:* Sol Duc Hot Springs, 1 KU; Snow Cr., 1200′, 2 USNM; *Clark Co.:* 3.5 mi E 5 mi N Yacolt, 500′, 1 MVZ; *Cowlitz Co.:* 4 mi E mouth Kalama R., 1 MVZ; 6 mi E mouth Kalama R., 2 MVZ; *Gray's Harbor Co.*, Quinault Lake, 7 USNM; *Okanogan Co.:* W fork, Pasayten R., 4700′, 2 USNM; *Pacific Co.:* 2.5 mi SE Chinook, 10′, 13 MVZ; *Pierce Co.:* E gate McChord Air Force Base, 1 UM; Puyallup, 1 USNM; *Skagit Co.*, Mount Vernon, 2 USNM; *Skamania Co.*, Mt. St. Helens, Spirit Lake, 3200′, 4 USNM; *Snohomish Co.:* Silverton, Dickerman Pk., 5000′, 1 USNM; *Wahkiakum Co.*, Cathlamet, 2 USNM; *Whatcom Co.:* Barron, 5000′, 2 USNM.

S. *monticolus shumaginensis*. Total number, 19.—ALASKA: 1 mi NE Anchorage, 100′, 1 KU; Bethel, 1 USNM; Chevak, 61°40′N, 165°18′W, 1 USNM; Chignik, 1 USNM; Izembek Bay, 3 USNM; Kenai Peninsula, Indian Cr., Lower Kenai Lake, 1 CAS; Nagai Is., 1 USNM; Petra Cr., 20 mi NE Anchorage, 300′, 1 KU; Popof Is., Shumagin Islands, 3 USNM (incl. holotype); Sanak Is., 3 USNM; 6 mi WSW Snowshoe Lake, Glenn Hwy., 2 KU; Takotna, 1 USNM.

S. *monticolus soperi*. Total number, 3.—MANITOBA: Riding Mountain Nat. Park, 2.5 mi NW Lake Audy, 1 UAMZ (topotype); Riding Mountain Nat. Park, Swanson Cr., 1 UAMZ; SASKATCHEWAN: Prince Albert Nat. Park, Spruce R. Twnshp., 1 UAMZ.

Sorex pacificus

S. *pacificus pacificus*. Total number, 24.—CALIFORNIA: *Del Norte Co.:* Crescent City, 1 KU; 8 mi E Crescent City, 1 MVZ; Klamath, 1 CAS; 6 mi N Klamath, 2 MVZ; Requa, 2 CAS; *Humboldt Co.:* Eureka, 1 KU; *Siskiyou Co.:* 12 mi WNW Happy Camp, Poker Flat, 5000′, 9 MVZ; 3 mi W Klamath R., Clear Cr., 1400′, 1 MVZ; OREGON: *Coos Co.:* Marshfield (=Coos Bay), 1 USNM; Myrtle Point, 1 USNM; *Curry Co.:* 3 mi above Gold Beach, S side Rogue R., 3 MVZ; *Douglas Co.:* Ft. Umpqua, 1 USNM (holotype).

S. *pacificus sonomae*. Total number, 2.—CALIFORNIA: *Marin Co.:* Inverness, 1 USNM; *Sonoma Co.:* Gualala, 1 MVZ (holotype).

S. *pacificus yaquinae*. Total number, 40.—CALIFORNIA: *Siskiyou Co.:* 15 mi W Hilt, Donomore Meadow, 5800′, 1 MVZ; OREGON: *Benton Co.:* Philomath, 2 USNM; *Douglas Co.:* Gardiner, 7 MVZ, 2 USNM; 1.3 mi E Gardiner, 5 MVZ; Elkhead, 1 USNM; *Jackson Co.:* E. Fork, Ashland Cr., 0.6 mi N junct. F.S. rd. 3903, 3 SOMNH; *Klamath Co.*, Crater Lake Nat. Park, Munson Valley, 1 USNM; S end Lake of the Woods, 1 MVZ; *Lane Co.:* Mapleton, 3 USNM; Mercer, 1 MVZ; Vida, 2 USNM; *Lincoln Co.:* Newport, Yaquina Bay, 1 MCZ, 5 MVZ, 1 USNM (holotype); Taft (=Lincoln City), 4 MVZ.

Sorex vagrans

S. *vagrans halicoetes*. Total number, 39.—CALIFORNIA: *Alameda Co.:* Berkeley, 1 USNM; Dumbarton Point, 1 KU; West Berkeley, 1 USNM; *San Francisco Co.*, San Francisco, 6 CAS, 4 USNM; *San Mateo Co.:* Colma, 20

CAS; San Mateo, 2 USNM; *Santa Clara Co.:* Palo Alto, 3 USNM, 1 MVZ (holotype).

S. vagrans orizabae. Total number, 29.—MEXICO: Salazar, 2 USNM; 1 mi W Salazar, 9850′, 1 KU; Nevada de Toluca, 13700′, 1 KU; Nevada de Toluca, 5 mi S Raicer, 1 USNM; Nevada de Toluca, 16 mi SSW Toluca, 3 USNM; N slope Volcan de Toluca, 3 USNM; MICHOACAN: Nahuatzin, 3 USNM; Patamban, 1 USNM; Mt. Tancitaro, 4 USNM; MORELOS: Cerro Cruz del Marquez, 2440 m, 1 UNAM; PUEBLA: Mt. Orizaba, 6 USNM (incl. holotype); TLAXCALA: Mt. Malinche, 2 USNM; VERACRUZ: Cofre de Perote, 1 USNM.

S. vagrans paludivagus. Total number, 1.—CALIFORNIA: *Monterey Co.:* 4 mi. W Pacific Grove, Bird Rocks, 1 KU. (Identification questionable; may be *S. ornatus.*)

S. vagrans vagrans. Total number, 1130.—BRITISH COLUMBIA: Cranbrook, 10 USNM; Creston, Kootenay Valley, 4 CAS; Enderby, 1 KU; Glacier Nat. Park, 4 USNM; Hope, 2 MCZ; Okanagan, 1 USNM; Okanagan Lake, 3 USNM; Mt. Revelstoke Nat. Park, 1 USNM; Mt. Richter, 3 mi E Similkameen R., 1 USNM; Sumas, 1 MCZ; Vancouver, Point Grey, 2 UM; CALIFORNIA: *Del Norte Co.:* Requa, 1 CAS; *El Dorado Co.:* Tallas, 3 USNM; *Humboldt Co.:* Capetown, 2 CAS; Samoa Pen., 0.5 mi N Coast Guard, 1 CSLB; *Inyo Co.:* Alvord, Owens Valley, 1 USNM; *Lassen Co.:* Bogard R. S., 2 CAS; *Marin Co.:* 5 mi W Inverness, 1 KU; Head, Limantour Bay, 2 CAS; White Gulch, 5′, 1 UM; *Mendocino Co.:* 6 mi NE Cummings, 2500′, 1 CAS; Hearst P. O., 1 CAS; Laytonville, 1 CAS; *Modoc Co.:* Davis Creek, Goose Lake, 1 USNM; *Mono Co.:* 1 mi W June Lake, 1 CSLB; Mammoth, 1 USNM; Mammoth Pass, 1 USNM; Mono Lake, 1 USNM; Head Owens R., near Mammoth, 1 USNM (holotype, *S. amoenus); Nevada Co.:* Boca Springs, 6000′, 1 MVZ; 2 mi N 5 mi W Hobart Mills, 6900′, 3 MVZ; Independence Lake, 9 MVZ; Sagehen Cr., 6500′, 23 MVZ; Sagehen Cr., 3 mi NW Hobart Mills, 1 CSLB; *Placer Co.:* Donner, 3 USNM; 5 mi S Sagehen Cr., west bank Truckee R., 4 MVZ; *Plumas Co.:* 8 mi NW Greenville, 1 USNM; Spring Garden Ranch, Grizzly Mts., 2 USNM; 12 mi NE Prattville, 2 USNM; Sierra Valley, 1 USNM; *Shasta Co.:* Carberrys Ranch, 4 USNM; Casell, 2 USNM; Fall R. Valley, Fall Lake, 2 USNM; Ft. Crook, 10 USNM; Goose Valley, 2 CAS; Kellys, Warner Cr., 5200′, 1 KU; SE side, Lassen Pk., 2 USNM; *Sierra Co.:* 3.2 mi W 1 mi N Calpine, McNair Meadow, 5300′, 3 MVZ; 3 mi N Independence Lake, 1 CAS; Lincoln Cr., 1 USNM; *Siskiyou Co.:* Beswick, 1 USNM; Big Springs, 1 CAS; Brownell, 1 USNM; Goose Nest Mt., 2 USNM; Gordon Ranch, 1 CAS; Hornbrook, 3 USNM; Indian Tom Lake, 4 mi N Dorris, 1 CSLB; Mayten, Shasta Valley, 2 USNM; Medicine Lake, 6671′, 4 MVZ; Mt. Shasta, upper Ash Cr., 1 USNM; Mt. Shasta, Mud Cr., 1 USNM; Mt. Shasta, upper Mud Cr., 2 USNM; Mt. Shasta, timberline, Mud Cr., 6 USNM; Mt. Shasta, Squaw Cr., 7800′-8100′, 3 USNM; Mt. Shasta, head, Squaw Cr., 2 USNM; Mt. Shasta, Wagon Camp, 3 MVZ, 5 USNM (incl. holotype, *S. shastensis*); 0.5 mi SW Mt. Shasta City, 3400′, 4 MVZ; Sisson, 1 MVZ; Squaw Cr. Valley, Warmcastle Soda Springs, 2 USNM; *Tehama Co.:* Battle Cr. Meadow, 4800′, 3 MVZ; Lyonsville P. O., Turner's, 3500′, 2 MVZ; Mineral, 3 MVZ; IDAHO: *Adams Co.:* New Meadows, 1 USNM; 3 mi W Payette Lake, 5400′, 2 MVZ; summit, Smith Mt., 7500′, 4 KU; Tamarack, 1 USNM; *Bannock Co.:* 1 mi W Bancroft, 5300′, 1 KU; Pocatello, 2 KU, 1 USNM; 9.5 mi E Pocatello, W fork Rapid Cr., Barrett Ranch, 1 MVZ; 6.5 mi E Pocatello, N fork Pocatello Cr., 1 MVZ; 2.5 mi NW Pocatello, 2 UM; E Pocatello, Schutt's Mine, 6500′, 4 MVZ; 5 mi E Pocatello, S fork Pocatello Cr., 1 MVZ; Swan Lake, 1 USNM; *Blaine Co.:* Alturas (=Sawtooth) Lake, 7000′, 1 MVZ, 1 USNM; *Boise Co.:* Bald Mt. R. S., 10 mi S Idaho City, 1 USNM; Boise Nat. For., Deer Park Guard Station, 4800′, 1 USNM; Boise Nat. For., Hunter

Cr., 4900′, 1 USNM; *Bonner Co.:* Cabinet Mts., Priest Lake, 4 USNM; 5 mi W Coeolalla, 3500′, 7 MVZ; *Bonneville Co.:* Irwin, 1 USNM; 10 mi SE Irwin, 2 USNM; *Boundary Co.:* Cabinet Mts., E of Priest Lake, 1 USNM; *Butte Co.:* 1 mi W Arco, 1 DCM; *Canyon Co.:* Nampa, 1 MVZ, 5 USNM; *Cassia Co.:* Albion, 1 USNM; *Clearwater Co.:* 2 mi NE Weippe, 3000′, 1 MVZ; *Elmore Co.:* Cayuse Cr., 10 mi N Featherville, 1 USNM; Trail Cr., Boise Nat. For., 4850′, 1 USNM; *Franklin Co.:* 20 mi NE Preston, 1 MVZ; *Gooding Co.:* 2 mi E Hagerman, 1 MVZ; *Idaho Co.:* 4 mi SSW Lolo Pass, Brushy Cr., 4000′, 7 CAS; 3 mi SW Selway Falls, 1 CAS; 4 mi SW Selway Falls, 2 CAS; *Kootenai Co.:* Coeur d'Alene, 3 USNM; Coeur d'Alene, Deception Cr. Exp. Forest, 1 UM°; Coeur d'Alene, near mouth, Montford Cr., 2 USNM; Hoodoo Valley, 2 CAS-SU; *Latah Co.:* Cedar Mts., 1 CRCM°; Cedar Mts., 1 mi S Cedar Peak, 1 CRCM°; Cedar Mts., WSC Camp, 2 CRCM°; *Lewis Co.:* Nez Perce, 2 USNM; *Power Co.:* (near?) Pocatello (in Bannock Co.), 1 KU; 4 mi S Portnouf R., Bannock Cr., 1 MVZ; *Shoshone Co.:* Glidden Lakes, 5700′, 1 MVZ; Mullan, 2 USNM; Osburn, 1 USNM; *Twin Falls Co.:* 8 mi W Rogerson, Salmon Cr., 1 MVZ; *Valley Co.:* Payette Nat. For., Landmark Ranger Station, 10 mi E Warm Lake, 6000′, 1 USNM; 5 mi E Warm Lake, 7000′, 2 MVZ; *Washington Co.:* SW slope Cuddy Mt., 1 mi NE Heath, 4000′, 5 KU; MONTANA: *Flathead Co.:* Glacier Nat. Park, Camas Cr. (cabin) 2.5 mi ENE Kintla Lake Rd., 3800′, 8 UM°; Glacier Nat. Park, 2 mi N Camas Cr. cabin, 3700′, 1 UM°; Glacier Nat. Park, Fern Cr., on Kintla Lake Rd., 3500′, 3 UM°; Glacier Nat. Park, Fish Cr., on Kintla Lake Rd., 3300′, 2 UM°; Glacier Nat. Park, Fish Cr., 4 USNM; Nyack, 1 USNM; *Flathead-Glacier Co.* Line: Summit, 2 USNM; *Granite Co.:* Rock Cr. drainage, Cougar Cr., 1 UM; Frog Pond Basin, 1 UM; *Lake Co.:* Flathead Lake, 1 UM°, 7 USNM; Flathead Lake, base Finley point, 1 UM°; Flathead Lake, E shore (Yellow Bay), MSU [=UM] Biol. Sta., 2950′, 4 UM°; 0.25 mi NW UM Biol. Sta., 2950′, 2 UM°; 0.5 mi E MSU [=UM] Biol. Sta., 3200′, 1 UM°; 1.25 mi S UM Biol Sta., 1 UM°; 4.5 mi N UM Biol. Sta., 3100′, 6 UM°; 5 mi N UM Biol. Sta., 3200′, 10 UM°; Yellow Bay Cr., 3000′, 11 UM°; Yellow Bay State Park, 2950-3000′, 5 UM°; Moiese, Nat. Bison Range, 3000′, 4 UM°; 0.2 mi N Moiese, 2600′, 2 KU; Ninepipe Reservoir, 1 UM°; 2 mi W Ronan, 1 UM°; *Lincoln Co.:* Leigh Cr., 3600′, 1 UM; *Missoula Co.:* Lolo, 1 UM°; 6.5 mi W Lolo, Lolo Cr., 3470′, 2 MVZ; Missoula, Buckhouse Bridge, 3 UM°; Missoula, Deer Cr. (several localities), 11 UM°; Missoula, Greenough Park, 12 UM°; Missoula, Pattee Canyon (several localities), 11 UM°; Missoula, Missoula Country Club, 1 UM°; Missoula, Rattlesnake Cr. (several localities), 6 UM°; Missoula, UM Arboretum, 3 UM°; 15 mi WNW Missoula, 1 UM°; *Ravalli Co.:* Bass Cr., 1 UM°; Bass Cr., NW Stevensville, 4600′, 3 USNM; Conner, Medicine Hot Springs, 1 DCM°; Corvallis, 12 DCM°, 7 USNM; 3 mi S Darby, 2 DCM°; Florence, 6 MSUDZ°, 3 USNM; Florence, Sweeney Cr., 1 MSUDZ°; 1 mi E Florence, 1 UM°; 2 mi W Florence, 3 USNM; 3 mi SW Florence, 1 USNM; Hamilton, 3600′, 10 DCM°; Hamilton, S city park, 3 UM°; 0.5 mi W Hamilton, 1 DCM°; 1 mi E Hamilton, 6 DCM°; 2 mi E Hamilton, 3700′, 35 DCM°; 3 mi E Hamilton, 3700′, 129 DCM°; 4 mi E Hamilton, 3800′, 8 DCM°; 5 mi E Hamilton, 8 DCM°; 6 mi E Hamilton, 3700′, 1 KU; 10 mi S Hamilton, 2 DCM°; Ross Hole (Sula), 3 DCM°; Stevensville, 6 USNM; 7 mi N 9 mi E Stevensville, Three-mile Cr., 4500′, 35 UM°; 8 mi S 9 mi E Stevensville, Burnt Fork, 5050′, 10 UM°; *Sanders Co.:* Prospect Cr., 5 USNM; Thompson Pass, 1 USNM; NEVADA: *Elko Co.:* Jarbidge Mts., summit between heads, Copper and Coon Crs., 4 KU; Mountain City, 1 USNM; Ruby Lake, 3 USNM; Ruby Mts., 7 USNM; Ruby Mts., Harrison R. S., Green Mt. Canyon, 6 KU; Ruby Mts., S fork Long Cr., 4 KU; Ruby Mts., W side Ruby Lake, 3 mi N White Pine Co. Line, 8 KU; Ruby Mts., summit, Secret Pass, 6200′, 1 KU; Ruby Mts., Thomas Cr., 7600′, 1 MVZ; *Eureka Co.:* Evans, 1 MVZ; *Lander*

Co.: Kingston R. S., 7500′, 3 MVZ; *Lander-Nye Co.* line: Reese R., 6000-6890′, 3 USNM (incl. holotype S. *nevadensis); Nye Co.:* Bell's Ranch, Reese R., 6890′, 2 MVZ; Cloverdale, 1 USNM; *Ormsby Co.:* Marlette Lake, 8000′, 1 MVZ; *White Pine Co.:* Baker Cr., 6600′, 1 MVZ; Baker Cr., 8000′, 2 MVZ; Baker Cr., 11100′, 4 MVZ; Ruby Mts., W side Ruby Lake, 3 mi S Elko Co. Line, 6100′, 1 KU; OREGON: *Baker Co.:* Anthony, 5 MCZ, 3 USNM; Bourne, 2 USNM; Cornucopia, 8 USNM; Homestead, 1800′, 1 USNM; 3 mi NE Huntington, 2100′, 1 USNM; E Pine Cr., 2.5 mi NE Cornucopia, 1 USNM; Rock Cr., 1 USNM; McEwen, 1 USNM; *Benton Co.:* Corvallis, 1 KU; 0.5 mi W Corvallis, 1 KU; 1 mi S Corvallis, 1 KU; *Clackamas Co.:* Estacada, 1 KU; 10 mi S Skinner Ranch, 1 UM; *Crook Co.:* Maury Mts., 3 USNM; *Curry Co.:* Gold Beach, 3 USNM; Port Orford, 1 USNM; *Grant Co.:* Austin, 1 USNM; 15 mi NW Austin, 5400′, 1 USNM; 21 mi SE Prairie City, N fork Malheur R., 5000′, 1 MVZ; Strawberry Mts., 12 USNM; *Harney Co.:* Burns, 4 USNM; Diamond, 1 USNM; Steens Mts. (T32S R33E Sec 32), 1 MVZ; *Hood River Co.:* W slope Mt. Hood, near timberline, 1 USNM; N slope Mt. Hood, 2800′, 1 USNM; *Jackson Co.:* Ashland, 1975′, 1 USNM (holotype S. *trigonirostris*); Ashland, 5 SOMNH; Ashland, Scenic Hills Mem. Park, 6 SOMNH; Ashland, Hy. W., 1 mi, 1 SOMNH; Field N of Ashland airport, 1 SOMNH; Denman Game Mgt. Area (T36S RIW Sec 30), 2 SOMNH; E fork, Ashland Cr., 0.6 mi N junct. F.S. rd. 3909, 1 SOMNH; Emigrant Cr., below Dead Indian Bridge, 1 SOMNH; W slope, Grizzly Peak, 3500′, 1 USNM; 6 mi S Medford, 1 MVZ; No exact locality, 1 SOMNH; *Klamath Co.:* Diamond Lake, 1 USNM; Ft. Klamath, 2 USNM; Klamath Falls, 5 USNM; W Silver Cr., 10 mi SW Silver Lake, 3 USNM; Yamsay Mts., Yamsay R., 4800′, 1 USNM; *Lake Co.:* 10 mi SE Lakeview, 1 USNM; *Malheur Co.:* Jordan R., 8 mi W Jordan Valley, 1 USNM; *Multnomah Co.:* Portland, 1 KU; *Tillamook Co.:* Tillamook, 1 USNM; No exact locality, 3 KU; *Umatilla Co.:* Meacham, 3 USNM; 10 mi W Meacham, 2 USNM; 15 mi E Weston, Langdon Lake (=Tollgate), 3 MVZ; 11 mi E Weston, 4 mi W Langdon Lake, 2 MVZ; Blue Mts., Meacham L., 3800′, 2 MVZ; *Union Co.:* Elgin, 2 USNM; Hot Lake, 2 USNM; Kamela, 2 USNM; *Wallowa Co.:* Enterprise, 25 mi N Sled Springs, 4600′, 4 USNM; 16 mi S 3 mi E Lostine, 5500′, 1 MVZ; Wallowa Lake, 4000-4800′, 6 MVZ; 21 USNM; *Wheeler Co.:* 11 mi W 7 mi S Mitchell, 4850′, 3 MVZ; UTAH: *Box Elder Co.:* Mouth of Bear R., 2 USNM; Bear R. Refuge, 1 USNM; Brigham City, 4500′, 1 USNM; *Cache Co.:* Tony Grove, Logan Canyon, 6400′, 1 MVZ; *Davis Co.:* Bountiful, 0.5 mi SW of oil refinery, 4300′, 1 UU; W Clearfield, W of Smithfield cannery, 1 UU; Farmington Bay area, 4 UU; Farmington Bay, jct. Turpin and Main ditches, 4250′, 1 UU; Farmington Lake, 1 UU; W Layton, 1 UU; Steeds Canyon, 1 UU; *Salt Lake Co.:* City Cr. Canyon, 4600′, 1 UU; 1 mi W Draper, 4500′, 2 UU; Rocky Glen at mouth of Emigration Canyon, 4880′, 1 UU; Lamb's Canyon, Salamander Lake, 9000′, 1 UU; Midvale, 1 USNM; Midvale, "9000 S" [block] and Jordan R., 4200′, 1 UU; Mount Dell Canyon, 5400′, 1 UU; Parley's Canyon, 5000′, 2 UU; Salt Lake City, 1 USNM; 1 mi W Salt Lake City airport, 1 UU; Spring Run, 9th E and 56 S, 4400′, 1 UU; *Utah Co.:* Palmyra, 1 BYU; Provo, 1 BYU, 1 USNM; Provo City Park, Provo Canyon, 1 BYU; Provo, Rock Canyon, 1 BYU; 4 mi NE Provo, 1 UU; Spanish Fork Bench, 1 BYU; *Weber Co.:* Farr West, 1 UU; Hooper Bay Refuge, 1 UU; Ogden, 4 USNM; Ogden, Melan's Basin, Mt. Ogden, 9000′, 1 UU; N side Pine View Lake, 1 UU; Riverdale, 4200′, 1 UU; Riverdale, 4250′, 1 UU; 2 mi W Roy P. O., 5 UU; South Ogden, 1 UU; Birch Cr., 1 mi N South Ogden, 4500′, 1 UU; Snow Basin, 2 UU; Snow Basin, S part of Wheeler Canyon, 1 UU; Uintah, 1 UU; WASHINGTON: *Adams Co.:* Twelve-mile Slough, 1 CRCM*; *Asotin Co.:* 5 mi W Anatone, 1 MVZ; 9 mi W Asotin, 1 CRCM*; Bly, 1000′, 1 USNM; Rogersburg, 1 USNM; *Chellan Co.:* Entiat R., 20 mi from mouth, 1680′, 2 USNM; *Clallam or Jefferson Co.:*

Olympic Mts., 1 USNM; *Columbia Co.:* Blue Mts., 21 mi SE Dayton, 1 USNM; Godman Spring, 2 MVZ; Humfrey ("Humpeg"?) Falls, 1 MVZ; Starbuck, 645′, 1 CRCM°, 1 USNM; *Grant Co.:* Moses Lake, 1000′, 1 USNM; 10 mi S Moses Lake, 2 USNM; *King Co.:* Seattle, 3 KU; *Kittitas Co.:* 21 mi S Blewett Pass, 3000′, 3 USNM; Easton, 2 USNM; Ellensburg, 1500′, 2 USNM; *Lewis Co.:* 7 mi E Centralia, 1 USNM; *Lincoln Co.:* 4.5 mi SW Davenport, 1 CRCM°; 11 mi N Odessa, 1 CRCM°; Sylvan Lake, 6 mi E Odessa, 4 USNM; Sprague Lake, 1 USNM; *Okanogan Co.:* E end, Bauerman Ridge, near head, Haig Cr., 6500′, 1 USNM; Conconully, 2 USNM; Hidden Lake, 4100′, 1 USNM; Loomis, 1300′, 1 USNM; Oroville, 1 USNM; Oroville, Osoyoos Lake, 1000′, 1 USNM; Sheep Mt. (Park Mt.), 6500′, 3 USNM; Twisp, 1600′, 1 USNM; *Pacific Co.:* Shoalwater (Willapa) Bay, 2 USNM (incl. holotype); Shoalwater Bay, Tokeland, 3 USNM; *Pend 'Oreille Co.:* 9 mi N Metaline, 2600′, 2 USNM; Newport, 1 USNM; Salmo Mt., Salmo Pass (summit), 5600′, 1 CRCM°; Sullivan Lake, 3000′, 1 CRCM°, 1 USNM; *Pierce Co.:* Mt. Rainer, Bear Prairie, 1 USNM; Puyallup, 2 USNM; Steilacoom, 3 USNM (incl. holotype, *S. suckleyi*); Tacoma, 2 UM; *San Juan Co.:* San Juan Is., 4.5 mi NW Friday Harbor, 4 KU; 1.5 mi W Friday Harbor, 1 KU; *Skagit Co.:* Cypress Is., 1 KU, 2 MVZ; Mt. Vernon, 1 USNM; *Skamania Co.:* 5 mi N Willard, 1 USNM; *Snohomish Co.:* 0.5 mi N 7 mi W Marysville, 3 KU; *Spokane Co.:* Marshall, 7 USNM; *Stevens Co.:* Chewelah, 2 KU; 5 mi S Colville, 1 KU; 15 mi E Colville, 1 USNM; Marcus, 1 USNM; *Thurston Co.:* Olympia, 5 USNM; *Wahkiakum Co.:* Cathlamet, 1 USNM; *Walla Walla Co.:* College Place, 1 KU; Walla Walla, 1 KU; *Whatcom Co.:* Barron, 5000′, 1 USNM; *Whitman Co.:* Armstrong, 1 CRCM°; Pullman, 1 CRCM°, 2 USNM; 1 mi E Pullman, 1 CRCM°; 2 mi N Pullman, 2 CRCM°; 4 mi ENE Pullman, 2400′, 1 KU; 13 mi S Pullman, 1 CRCM°; Tekoa, Hangman Cr., 1 CRCM°; Wawawai, 4 CRCM°; 5 mi NE Wawawai, 1 USNM; *Yakima Co.:* Mt. Adams, Bird Lake, 3 USNM; Selah, 5 KU; Wiley City, 10 mi W Yakima, 2000′, 4 USNM; Yakima Indian Reservation, Signal Peak, 4000′, 1 USNM; WYOMING: *Lincoln Co.:* 10 mi N Afton, 6200′, 3 USNM; 13 mi N 2 mi W Afton, 6100′, 6 KU; 9 mi N 2 mi W Afton, 6 KU; 7 mi N 1 mi W Afton, 3 KU; Cokeville, 6400′, 1 USNM; 12 mi N 2 mi E Sage, 2 KU; 6 mi N 2 mi E Sage, 1 KU.

S. vagrans vancouverensis. Total number, 16.—BRITISH COLUMBIA (Vancouver Island): Cowichan Lake, 1 USNM; Colwood, 1 USNM; Departure Bay, 1 USNM; Errington, 1 MVZ; French Cr., 1 MVZ; Golden Eagle Mine, 1 MVZ; Goldstream, 1 MVZ, 1 USNM (holotype); Nanaimo, 3 USNM; Parksville, 1 MVZ; Saturna Is., 4 MCZ.